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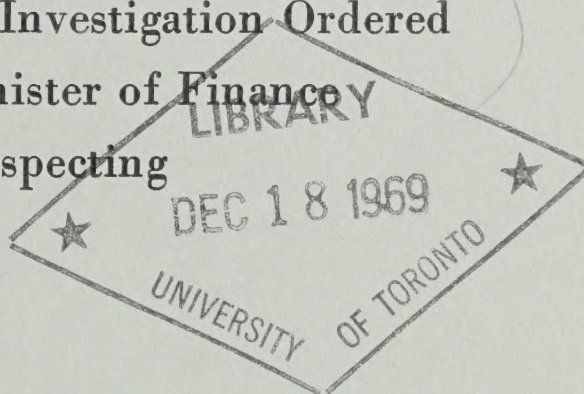
Tariff Board

Report (by) *of*

THE TARIFF BOARD

in Reference[s]

(Relative to the Investigation Ordered
by the Minister of Finance
respecting



Fractions of Petroleum for use as Feedstocks
in the Manufacture of Organic Chemicals

Reference No. 141



CANADA

Report by
THE TARIFF BOARD

Relative to the Investigation Ordered
by the Minister of Finance
respecting

Fractions of Petroleum for use as Feedstocks
in the Manufacture of Organic Chemicals

Reference No. 141

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Ottawa, 1969

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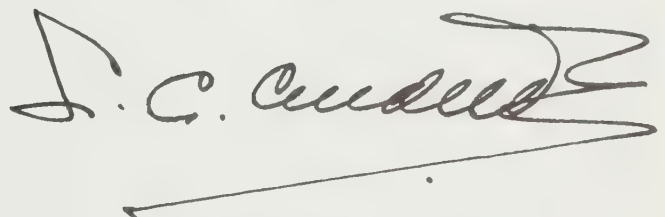
The Honourable
The Minister of Finance
Ottawa

Dear Mr. Minister:

I refer to your letter dated November 28, 1968, in which you directed the Tariff Board to study and report on tariff items 26901-1 and 26902-1 in so far as they relate to fractions of petroleum for use as feedstocks in the manufacture of organic chemicals.

In conformity with Section 4(2) of the Tariff Board Act, I have the honour to transmit the Report of the Board relating to fractions of petroleum for use as feedstocks in the manufacture of organic chemicals, in English and in French. A copy of the transcript of the proceedings at the public hearings accompanies the Report.

Yours faithfully,

A handwritten signature in dark ink, appearing to read "J. C. Audette", with a long, sweeping horizontal line extending from the end of the signature.

Chairman

Explanation of Symbols Used

- Denotes zero or none reported
- .. Indicates that figures are not available
- * In statistical tables, indicates a reported figure which disappears on rounding, or is negligible
- (a) A small letter in brackets denotes a footnote to a table
- s.c. Denotes a Dominion Bureau of Statistics import or export statistical class

The sum of the figures in a table may differ from the total, owing to rounding

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LETTERS OF REFERENCE

Ottawa, November 28, 1968

Mr. L.C. Audette
Chairman
The Tariff Board
Ottawa

Dear Mr. Audette:

Under Reference 141 the Tariff Board was directed to study and report on tariff item 26901-1 in so far as it relates to naphtha for use in the production of petrochemicals. Recently new information has been submitted to the Department regarding this Reference.

In light of this information I have come to the conclusion that it would be desirable to make a change in the terms of reference. Accordingly, I would ask that the Tariff Board make its study and report on tariff items 26901-1 and 26902-1 in so far as they relate to fractions of petroleum for use as feedstocks in the manufacture of organic chemicals, in particular those primary organic chemicals derived directly from such feedstocks.

Yours sincerely, .

E.J. BENSON

Ottawa, March 14, 1968

Mr. L.C. Audette
Chairman
The Tariff Board
Ottawa

Dear Mr. Audette:

Representations have been received requesting the removal of the duties on naphtha for use in the production of petrochemicals. Representations opposing this request have also been received.

In view of the divergence of views which have been expressed, I consider it desirable to have the Tariff Board conduct a thorough review of the matter. I therefore direct the Tariff Board to make a study and report under section 4(2) of the Tariff Board Act on tariff item 26901-1 in so far as it relates to naphtha for use in the production of petrochemicals.

If the Board's study should indicate that amendments to the Customs Tariff are desirable, I would request the Board to include in its report recommendations regarding any such amendments.

I would ask also that the Board submit its report as soon as possible.

Yours sincerely,

MITCHELL SHARP

Companies and Agencies Which Made Representations

A public hearing before the Board was held at Ottawa on March 10, 11, 12, 13, 14, 17, 18 and 19, 1969.

Representations were received from the following:

Union Carbide Canada Limited	Toronto, Ontario
Chemcell Limited	Montreal, Quebec
Gulf Oil Canada Limited	Toronto, Ontario
Imperial Oil Limited	" "
Newfoundland Refining Company Limited	Montreal, Quebec
Petrofina Canada Limited	" "
Shell Canada Limited	Toronto, Ontario
The Government of Alberta	Edmonton, Alberta

INTRODUCTION

In his letter, the Minister instructed the Tariff Board to make a study of "tariff items 26901-1 and 26902-1 in so far as they relate to fractions of petroleum for use as feedstocks in the manufacture of organic chemicals, in particular those primary organic chemicals derived directly from such feedstocks". In general, these two tariff items apply to the petroleum fractions not specifically provided for in other items and include a large number of liquid petroleum products ranging from light naphthas to heavy gas oils. Under tariff item 26901-1, which applies to products of petroleum n.o.p., whose specific gravity is less than .8236 at 60° F., the rates are $\frac{3}{4}$ cent per gallon, B.P. and one cent per gallon, M.F.N.; under tariff item 26902-1, which applies to products of petroleum n.o.p., whose specific gravity is .8236 or more, the rates are $\frac{1}{3}$ cent per gallon under both the B.P. and M.F.N. Tariffs. In general, it is the M.F.N. rates which were of direct interest to the parties making representations in respect of this Reference.

At the public hearing, two companies, Union Carbide Canada Limited and Chemcell Limited, whose principal interest in this Reference was as manufacturers of organic chemicals, urged that the petroleum fractions which they require as raw materials should be free of duty when imported for use as feedstocks in the production of the organic chemicals in which they were interested. This request was opposed by four oil refining companies who urged that the existing rates under tariff items 26901-1 and 26902-1 should remain unchanged. These companies were: Gulf Oil Canada Limited, Imperial Oil Limited, Petrofina Canada Limited, and Newfoundland Refining Company Limited.

In the representations before the Board, the main interest was in the use of naphtha as a feedstock for the manufacture of ethylene and, to a lesser extent, for the manufacture of methanol. The Board's attention was also directed to heavier feedstocks and a number of other chemical and petroleum products which are co-products of the manufacture of ethylene.

The two chemical producers claimed that the existing duty on petroleum fractions allowed Canadian refiners to price petroleum feedstocks in relation to the laid-down cost of the corresponding foreign materials and, therefore, had the effect of increasing the cost of their principal raw material. This, they said, constituted a serious handicap to their ability to compete with producers of chemicals in other countries. They said that large scale chemical plants are required if Canada is to be competitive with foreign producers but that such plants cannot be economically justified unless petrochemical feedstocks are available to Canadian users at prices which are comparable with those paid by producers in other countries.

They also contended that the treatment of petroleum feedstocks in the Canadian Customs Tariff was anomalous because the ad valorem equivalent of the existing M.F.N. duty was about 13 p.c. whereas the rates of duty on some of the principal products made from these fractions was of the order of $7\frac{1}{2}$ p.c. to 10 p.c. They submitted data indicating that other industrialized countries admitted petrochemical feedstocks free of duty or at low rates and that some countries remitted other taxes on petroleum fractions when they were used as raw materials for the manufacture of organic chemicals.

The four oil refining companies claimed that the market demand for petroleum products supplied by Caribbean and European refineries is mainly for residual fuels and, therefore, that they have surpluses of light and middle distillates which would be a threat to the Canadian market if the existing duties on petrochemical feedstocks were removed. They said that these foreign refineries required less complex equipment and much smaller investments than Canadian refineries of comparable size.

The oil refining companies contended that the prices they charged for petrochemical feedstocks were comparable with the delivered costs of imported duty-free products if the cost of handling and of providing storage facilities for imported products were considered. They said the principal effect of an end-use item would be to depress the price of Canadian petroleum fractions in order to meet the competition of offers of surplus products from abroad at distress prices.

They also said that significant quantities of petroleum fractions are produced as co-products of the production of organic chemicals and that more than 50 per cent of the input of heavier feedstocks would be represented by such petroleum co-products. They expressed concern lest such petroleum co-products, produced from duty-free feedstocks, should affect their market for such products.

THE PRODUCTS

Petroleum Fractions

Crude oil and petroleum products derived from crude oil are mixtures of chemicals called hydrocarbons. The individual hydrocarbons in crude oil may contain from one to more than 70 carbon atoms, their molecular structure may be different, and they may have significantly different physical and chemical properties.

Petroleum fractions are obtained, initially, by a process of fractional distillation in which the feed material, crude oil, is heated to cause it to vaporize. The lightest hydrocarbons, those containing the fewest carbon atoms, vaporize at the lowest temperatures and, because they are gases, rise to the top and are removed from the condensation towers in which the process occurs. The temperature within the tower is lower near the top and, by placing a series of trays at intervals below one another, within the tower, a range of products from very light distillates to heavy, viscous fluids can be recovered; lighter fractions are condensed and removed near the top of the tower and heavier fractions near the bottom.

Because the boiling points of many individual hydrocarbons are not sufficiently different from each other for separation by fractional distillation, no matter how closely trays are positioned below one another, the petroleum fraction recovered from any one tray will consist of a mixture of hydrocarbons. If the trays are placed close to each other, vertically, 'narrow cuts' will be obtained whose minimum and maximum boiling points are within a relatively narrow range; if the trays are farther apart the petroleum fraction collected in them will contain a 'wide cut' and the maximum and minimum boiling points will cover a wider range of temperatures. Individual hydro-

carbons, of a purity which would allow them to be classified as chemicals, can be recovered by additionally refining and processing the petroleum fraction in which they occur.

In the first distillation at atmospheric pressure a crude oil might be separated into the fractions listed in table 1. Because crude oils vary considerably in composition, the yield of the various fractions will depend on their origin and composition. It is important to note that the petroleum fractions in table 1 must be further refined, blended or purified to produce most of the marketable products of petroleum shown in column three.

Table 1: Crude Petroleum Fractions Obtained from the Fractional Distillation of Crude Oil, at Atmospheric Pressure

<u>Fraction or Product</u>	<u>Approximate Boiling Range, °F.</u>	<u>Principal Use</u>
Fuel gas	-259 to -44	Refinery fuel - mainly methane
Propane	-44	Liquefied petroleum gas
Butane	11 to 31	Blended into gasoline
Light naphtha	80 to 300	Component of motor gasoline
Heavy naphtha	300 to 400	Catalytic reformer feed; blended into jet fuels
Kerosene	400 to 500	Fuel
Stove oil	400 to 550	Domestic furnace fuel
Light gas oil	400 to 600	Furnace and diesel fuel
Heavy gas oil	600 to 800	Feed for catalytic cracking
Vacuum gas oils	800 to 1100	Feed for catalytic cracking; lubricating oils
Pitch	1100+	Component of heavy fuel oils- asphalts

Source: Derived from Purdy, G.A., Petroleum, p. 127-8

The naphthas, whose boiling range is approximately 80° F. to 400° F., are the light distillates; after further processing, naphtha is a major component of motor gasoline. If imported, the light distillates would be classified in tariff item 26901-1. Kerosene, stove oil and light gas oil, together, are the middle distillates. These products are used to produce domestic and industrial furnace fuels, and diesel and tractor fuels. Vacuum gas oils and pitch are removed as a single fraction called 'reduced crude'; they are separated under vacuum distillation and are used for the purposes shown in table 1.

The naphthas listed in the table, or, more frequently, a full-range naphtha with a boiling range of approximately 100° to 400° F., are the most common liquid petrochemical feedstocks currently used in Canada for the production of ethylene. Gas oils are also used fairly extensively, mainly in integrated refinery-chemical operations where the production of a wide range of co-products is required.

The various petroleum products listed in table 1 are processed further and some are blended with others for particular uses. In addition some may be 'cracked' and others 'reformed'. In the cracking process, the heavier fractions, which consist mainly of molecules containing many carbon atoms, are subjected to appropriate combinations of temperature and pressure in the presence of a catalyst, which cause the large molecules to be broken into smaller ones. Catalytic cracking results in the creation of a wide range of products, including gases, light and middle distillates and residual products. In the reforming process, the lighter components, such as the gases, are converted into larger molecules; this process also yields a range of products. In theory, a modern oil refinery by an appropriate combination of processes available to it can convert crude petroleum to a single petroleum fraction; in practice this is never done because of the cost involved.

Petrochemical Feedstocks

In general, it is the gases and the light and middle distillates which are used as petrochemical feedstocks, although gas oils are also used for this purpose, particularly by some of the newer plants. In fact, a recent development is the design of so-called "chemical refineries" which use crude oil as the raw material in their operations; these are, as yet, in the developmental stage. The most common petrochemical feedstock used in Canada is a full-range naphtha with an approximate boiling range of 100° to 400° F.

The number of different chemical and petroleum products and the quantities of them that can be produced from a particular petroleum feedstock is mainly determined by the specific gravity (weight per unit volume) of the raw material used. Thus, the natural gas liquids, which are the principal feedstocks for ethylene production in the U.S. Gulf Coast area, yield small quantities of a small number of co-products (table 2); in contrast, gas oil yields much larger quantities of co-products, some of which can be processed further to yield additional products which are not shown in the table.

In a chemical plant, as in a refinery, the petroleum fractions which are used as feed materials are 'cracked' into smaller molecules. The first stages of processing of petroleum fractions in a chemical plant are indistinguishable from certain of the operations performed by a refinery. However, the processes by which relatively pure, individual, organic chemicals are separated from the product stream, are regarded as chemical processes even if they are performed as a part of refinery operations.

In Canada, as in other countries, the principal "basic" organic chemical manufactured from petroleum fractions is ethylene. Ethylene together with a relatively small number of other hydrocarbons are the precursors of all of the known organic chemicals and plastics. Because of its preponderant importance many plants are built to produce mainly ethylene. However, the use of even the simplest feedstocks results in the production of other hydrocarbons as well; when liquid petroleum fractions are used as the raw material, yields of other hydrocarbons are substantial.

Theoretically, any fraction of petroleum can be used for the production of organic chemicals; the feedstock used is determined by such economic considerations as the cost of the raw material, the yield of the products wanted, the value of co-products produced, the cost of building a plant able to use a particular feedstock, the additional costs of processing equipment for producing chemicals from co-product petroleum products, the difficulty (or ease) with which co-products can be disposed of, and other related matters.

Among the least expensive feedstocks for petrochemical production are the gases which result from refinery operations. Where a petrochemical plant is near a refinery these gases can be piped to the chemical plant and residues, mainly methane, can be used as fuel or be returned to the refinery. When they are used as petrochemical feedstocks the gases are valued chiefly for the ethylene and other olefins which can be obtained from them and, therefore, for the ethane, propane, and butane which they contain and which can be converted readily into corresponding olefins.

Apart from the gases, the principal feedstocks for petrochemical use are the liquid petroleum fractions whose maximum boiling point is less than 800° F. These include the naphthas, whose boiling range is between 100° and 400° F. and the gas oils, whose boiling range is from approximately 450° to 800° F. If a full-range naphtha is used for the production of ethylene there is a considerable joint production of C4 and C5+ fractions; together these two fractions may account for approximately 35 per cent of the weight of the naphtha used. In contrast the natural gas liquids used in the U.S. Gulf Coast region ("ethane" in table 2) would result in a less than five per cent yield of these co-products.

A comparison of the yields of various products from different feedstocks is given in table 2. The ethane in this table is representative of the natural gas liquids used by many U.S. Gulf Coast ethylene plants; the naphthas would be fairly representative of the most common petroleum fractions now used by Canadian ethylene producers. It should be noted that the Imperial Oil plant at Sarnia, the new plant of Shawinigan Chemicals, and the proposed plant of Union Carbide are all designed to use a range of feedstocks including gas oil; it is claimed that the Imperial Oil plant is able to use even heavier raw materials.

Table 2: Typical Yields from the Steam Cracking of Various Feedstocks in an Ethylene Plant

	<u>Ethane</u>	<u>Full-Range Naphtha</u>	<u>Heavy Gas Oil</u>
	- per cent of feedstock, by weight -		
Ethylene	76.2	31.2	23.3
Propylene	2.9	16.1	14.3
C4 fraction(a)	1.9	9.0	8.4
Pentanes plus (C5+)(b)	2.8	26.4	43.9
Fuel gas(c)	16.1	17.2	10.0

(a) Includes butadiene, iso-butene, N-butene, isobutylene and N-butylene

(b) Includes hydrocarbons with five or more carbon atoms

(c) Mainly methane

It is apparent, from table 2, that the 'cleanest' operation, from the standpoint of co-products produced, uses ethane (natural gas liquids) as its raw material. This type of plant is able to use only the one kind of raw material but is the cheapest to build. The use of heavy gas oil results in the production of large quantities of co-products and requires more equipment which is operated at higher temperatures and pressures. As a result such a plant costs more to build but is able to use a variety of feedstocks including gases and naphthas. The principal differences in yields of products from naphthas and gas oils are with respect to ethylene and the pentanes plus fraction. The yield of ethylene is higher from naphtha; the yield of pentanes plus is much higher from gas oil.

Organic Chemicals Derived from Petroleum Fractions

The organic chemicals which are manufactured from petroleum fractions and which are relevant to this study were specified in the letter of reference to be "organic chemicals, in particular those primary organic chemicals derived directly from such feedstocks", that is, feedstocks classified in tariff items 26901-1 or 26902-1.

Although the letter of reference directed the Board's attention particularly to "those primary organic chemicals derived directly from" petroleum feedstocks, the parties at the public hearing indicated that it would be impossible for them to define the term "primary organic chemicals", and some indicated that the phrase "derived directly from" would also create problems of definition. In their proposals, the chemical companies referred to the organic chemicals of headings 92901 and 92904. Heading 92901 relates to hydrocarbons; heading 92904 relates to certain alcohols, including methanol.

The discussions, at the public hearing, suggested that the principal interest of Union Carbide was in respect of ethylene, propylene, the butylenes, butadiene and the BTX's (benzene, toluene and xylenes), all of which are classified in heading 92901; Chemcell's interest appeared to be related mainly to methanol (methyl alcohol) and pentaerythritol, both of which are classified in heading 92904. Ethylene, propylene, the butylenes and butadiene are olefins; benzene, toluene and the xylenes are aromatics; methanol and pentaerythritol are alcohols.

The olefins are produced in large quantities in the normal course of refinery or chemical plant cracking operations; the BTX's are separated from the aromatic petroleum fraction in which they are concentrated; methanol is produced by hydrogenating certain of the hydrocarbons contained in natural gas and petroleum products and is the precursor of pentaerythritol in the process contemplated by Chemcell. The olefins are the most important precursors in the production of other organic chemicals and are often referred to as the "building blocks" from which almost all other organic chemicals are manufactured.

With the exception of the two alcohols, all of the other chemicals mentioned above are classified chemically as hydrocarbons, a very large group of organic chemicals the molecules of which consist of only carbon and hydrogen atoms. Each hydrocarbon chemical can be converted into a corresponding alcohol, acid, aldehyde, ketone, ether,

Table 3: Organic Chemicals and End Products
Derived from Petroleum Fractions

	Intermediates and Reactions			Product
ETHYLENE	$\xrightarrow{O_2}$ Ethylene Oxide	\xrightarrow{HCN} Ethylene Cyanohydrin	$\xrightarrow{-H_2O}$ Acrylonitrile	Poly. ORLON
ETHYLENE	$\xrightarrow{Cl_2}$ Ethylene Dichloride	\xrightarrow{Heat} Vinyl Chloride	+ Acrylonitrile	Co-polymerization { ACRILAN DYNEL
ETHYLENE	$\xrightarrow{O_2}$ Ethylene Oxide	$\xrightarrow{H_2O}$ Ethylene Glycol		ANTI-FREEZE
PARA-XYLENE	$\xrightarrow{O_2}$ Terephthalic Acid	+ Ethylene Glycol	Esterification	{ TERYLENE DACRON
CYCLOHEXANE	$\xrightarrow{O_2}$ Adipic Acid	$\xrightarrow{NH_3}$ Adiponitrile	$\xrightarrow{H_2}$ Hexamethylene Diamine	
			+ Adipic Acid	Polymerization NYLON
METHANE	\xrightarrow{NaOH} Cellulose	\rightarrow Soda Cellulose + Carbon Disulphite	\rightarrow Cellulose Xanthate	{ VISCOSE RAYON CELLOPHANE
PROPANE } BUTANE }	$\xrightarrow{O_2}$ Acetic Acid	\rightarrow Acetic Anhydride		
	Cellulose + Acetic Anhydride	\rightarrow Cellulose Triacetate	$\xrightarrow{Hydrolysis}$ Secondary Acetate	{ ACETATE RAYON PHOTO FILMS
ETHYLENE	$\xrightarrow{Cl_2}$ Ethylene Dichloride	$\xrightarrow{Cl_2}$ Trichloroethane	\xrightarrow{NaOH} Vinylidene Chloride	Poly. SARANS
METHANE	$\xrightarrow{Cl_2}$ Chloroform	$\xrightarrow{F_2}$ Chlorodifluoromethane	\xrightarrow{Heat} Tetrafluoroethylene	Poly. TEFLON
ETHYLENE	$\xrightarrow{Polymerization}$	Polyethylene		{ POLYTHENE MYLAR
PROPYLENE	$\xrightarrow{H_2O}$ Isopropyl Alcohol	$\xrightarrow{-H_2}$ Acetone	\xrightarrow{HCN} Acetone Cyanohydrin	$\xrightarrow{Hydrolysis}$
			Methyl Methacrylate	Polymerization { PLEXIGLAS LUCITE CRYSTALLITE PERSPEX
ISOBUTYLENE	Co-polymerization with Isoprene			BUTYL RUBBER
ETHYLENE	$\xrightarrow{Benzene}$ Ethyl Benzene	$\xrightarrow{-H_2}$ Styrene	$\xrightarrow{Polymerization}$	{ POLYSTYRENE PLASTICS AND "RUBBER" PAINTS
BUTYLENE	$\xrightarrow{-H_2}$ Butadiene	+ Styrene	Co-polymerization	{ GRS RUBBER POLYSAR
ETHYLENE	$\xrightarrow{Cl_2}$ Ethylene Dichloride	+ Sodium Tetrasulphide	Condensation	{ THIOKOL RUBBERS
ACETYLENE	$\xrightarrow{CuCl_2}$ Vinylacetylene	\xrightarrow{HCl} Chloroprene	$\xrightarrow{Polymerization}$	NEOPRENE
BENZENE	$\xrightarrow{Cl_2}$ Chlorobenzene	$\xrightarrow{Cl_2}$ Para-Dichlorobenzene		LARVACIDE
ETHYLENE	$\xrightarrow{Cl_2}$ Ethyl Alcohol	\rightarrow Chloral + Chlorobenzene	$\xrightarrow{H_2SO_4}$	DDT
PROPYLENE	$\xrightarrow{Polymerization}$	Propylene Tetramer	$\xrightarrow{Benzene}$ Dodecyl Benzene	DETERGENT

Source: G.A. Purdy, "Petroleum", Copp Clark Publishing Co. Ltd.,
p. 453

amine or another of the many families of organic chemicals. Moreover, each can be converted into a larger molecule and these, in turn, can be made into corresponding alcohols, aldehydes and so on and all of these might be combined with inorganic chemicals to produce still others. Thus, the possibilities of creating other chemicals from the hydrocarbons are practically unlimited. However, only a relatively small number of intermediate organic chemicals are made from the "basic" hydrocarbons and, considering the possibilities, few important end products are made directly from these intermediate organic chemicals.

The most important intermediates and end products are shown in table 3. Although the table is illustrative rather than comprehensive, it is readily apparent that it includes a large proportion of the economically significant intermediates and most of the important end products based on organic chemicals.

Hardly anyone would disagree if ethylene were designated as a "primary" organic chemical. However, relatively pure ethane could be obtained from a petroleum fraction and be used in the production of ethylene and, therefore, this ethane would then be a "primary" organic chemical and the ethylene produced from it would be an intermediate organic chemical. Indeed, since ethylene may be used to hasten the ripening of stored fruit or as an anesthetic, ethylene could be classed as a primary or intermediate organic chemical or as an end-product.

This indicates some of the difficulty in defining what is a "primary" organic chemical; it also suggests the problems involved in determining what it is that is "derived directly" from a petroleum fraction. Moreover, because some processes which result in relatively pure organic chemicals may be part of a refinery's operations or may be among the earlier of the chain of processes used by a manufacturer of organic chemicals, it is impossible to make meaningful distinctions on the basis of the industry which produces them.

THE PETROLEUM REFINING INDUSTRY

Petroleum refineries produce the liquid petroleum fractions which are the raw materials for the production of organic chemicals. At January 1, 1969 there were 41 refineries in Canada with a total capacity of 1.2 million barrels of crude oil per day. At that date, 32 per cent of the refineries and 62 per cent of the refining capacity were located in Ontario and Quebec.

At the beginning of 1968, the Department of Energy, Mines and Resources reviewed the position of the Canadian oil refining industry in the following terms.

"Canada's emergence as a major petroleum refining nation occurred in the 1948-1958 decade. The discovery of substantial oil resources in the same period provided a sound base upon which to build an inland refining industry ... In 1959, the Canadian refining industry, in terms of crude oil capacity, was the third largest after the United States and the Soviet Union ... Canada now ranks in ninth place as indicated in the following table.

"Crude Oil Refining Capacity of the First Ten Countries
(capacities in thousands of barrels daily)

1. United States	10,952	6. United Kingdom	1,844
2. Soviet Union	4,700	7. France	1,835
3. Italy	2,389	8. Venezuela	1,280
4. Japan	2,389	9. Canada	1,206
5. West Germany	2,167	10. Netherlands Antilles	795

"... refineries are not generally located at, or even near, the source of crude oil but rather at locations where product distribution to most customers involves minimum distances of transportation ... If the location permits receipts or deliveries of oil by tanker then this is an added benefit since traffic on water is normally the cheapest means of oil and product transport ...

(Petroleum Refineries in Canada, Operators List 5, January 1968)

All six Quebec refineries are located immediately east of Montreal where they can receive crude oil by the overland pipeline from Portland, Maine or by tanker. Thus, they are in a position to take advantage of the most economic foreign crudes and are located in the largest consuming area of the province. To conform with the National Oil Policy, these refineries cannot supply areas west of the "Ottawa Valley", except for some products of which Ontario has seasonal shortages.

In Ontario the refineries are located in the Sarnia and Toronto areas along the route of the interprovincial pipeline; three refineries are near Sarnia and four between Hamilton and Toronto. In Quebec all six of the existing refineries are located near Montreal. These are the most densely populated and most highly industrialized areas in Canada.

Refinery Capacity

Because of the concentrated demand for petroleum products in these areas the refineries located here are very much larger than those in other parts of Canada. At the beginning of 1969 the smallest refinery in Ontario had a capacity of 32,000 barrels of crude oil per day and the smallest in Quebec had a capacity of 52,500 barrels of crude per day. In contrast, only four of the 28 refineries in the rest of Canada had capacities exceeding 30,000 barrels per day and only one had a capacity exceeding 50,000 barrels per day. The regional distribution of Canadian crude oil refining capacity is given in table 4.

Crude oil refining capacity in Quebec is currently undergoing a very considerable expansion. Two new refineries are planned for the Quebec City area, one of 100,000 barrels of crude per day capacity (Golden Eagle) and one of 50,000 barrels per day (Irving). The former is expected to be in operation early in 1971; plans for the latter are still somewhat uncertain. In the Montreal area Petrofina is expanding its existing plant to a capacity of 100,000 barrels a day, an increase of 47,500 barrels, and Shell is increasing its refinery's capacity by 48,000 barrels a day, to 110,000 barrels of crude daily. Thus exclud-

ing the Irving plant, by 1971 Quebec capacity will total approximately 600,000 barrels of crude daily, an increase of 50 per cent over current capacity. In the Montreal area it will be about 500,000 barrels per day, 25 per cent more than at present.

Table 4: Regional Distribution of Canadian Crude Oil Refining Capacity, by Size of Refinery, as at January 1, 1969

	capacity in '000 barrels per day				Total
	Under 50	50-74	75-99	Over 100	
	- no. of refineries -				
Atlantic Provinces	3	1	-	-	4
Quebec	-	5	1	-	6
Ontario	5	1	-	1	7
Prairie Provinces	16	-	-	-	16
British Columbia ^(a)	8	-	-	-	8
Canada	32	7	1	1	41
	- capacity in '000 barrels per day -				
Atlantic Provinces	71.5	56.6	-	-	128.1
Quebec	-	311.0	89.4	-	400.4
Ontario	179.0	55.4	-	122.7	357.1
Prairie Provinces	220.3	-	-	-	220.3
British Columbia ^(a)	114.3	-	-	-	114.3
Canada	585.1	423.0	89.4	122.7	1,220.2

(a) Includes one refinery in N.W.T. whose capacity is 1,900 barrels of crude per day

Source: Dept. of Energy, Mines and Resources, Operators List 5

When these projects are completed, three of the six Montreal area refineries will have capacities of the order of 100,000 barrels of crude daily. The total capacity by 1971, of about 600,000 barrels daily will give the province about the same refining capacity as now exists in Belgium, Australia or Mexico and about two-thirds as much as in the Netherlands.

In addition to the above expansions, new refineries in eastern Canada are also planned at Point Tupper Nova Scotia, (60,000 barrels of crude daily) at Come-by-Chance, Newfoundland, (100,000 barrels daily) and at Toronto (75,000 to 100,000 barrels daily).

Canadian refineries east of the "Ottawa Valley" line designated by the National Energy Board use imported crude oil almost exclusively; refineries west of this line use only Canadian crude oil. The Montreal refineries are thus in a position to purchase crude oil at the lowest prices available and to receive these either by tanker, or by the overland pipeline from Portland, Maine.

Refineries in Ontario are in a different position with respect to crude oil supplies. To conform with the National Oil Policy they use only domestic crude oil in their refinery operations. Domestic crude laid down at Ontario refineries costs more than imported crude of the same specifications east of Ontario; as a result it would be expected that at least some petroleum products would be

priced higher west of the Ottawa Valley line than east of it. The National Oil Policy recognizes this situation by requiring that most petroleum products produced east of the Line should not be shipped into regions west of it except in exceptional circumstances and with the knowledge of the National Energy Board.

Refinery Production

In Canada, as in the U.S.A., the largest returns to oil refineries per barrel of product are from the light liquids which are used for gasolines and the lowest returns are for refinery gases and the heavy distillates. Apart from certain products which account for a very small part of a refinery's volume of sales, gasoline is the highest priced petroleum product shipped by a Canadian refinery; in 1967, 38 per cent of the volume and 46 per cent of the value of shipments were represented by motor gasoline. The light distillates of table 5, taken together, accounted for 45 per cent of the volume and 50 per cent of the value of shipments.

Table 5: Shipments of Petroleum Products by Canadian Oil Refineries, 1967

Product	Shipments			Proportion of:	
	Quantity	Total	Unit	Quantity	Value
	million bbl.	Value \$ million	Value \$ per bbl.	per cent	per cent
LP gas	6.4	16.1	2.52	1.7	1.1
Petrochemical					
feedstocks	10.3	32.9	3.21	2.8	2.2
Motor gasoline	141.3	676.1	4.79	38.5	45.8
Aviation					
turbine fuel	8.8	33.9	3.85	2.4	2.3
Kerosene, stove					
oil No. 1,					
tractor fuel	18.5	77.8	4.20	5.0	5.3
Diesel fuel	45.6	177.6	3.89	12.4	12.0
Fuel oils Nos.					
2, 3	62.1	232.6	3.75	16.9	15.8
Fuel oils Nos.					
4, 5, 6	54.3	127.4	2.34	14.8	8.6
Asphalt	12.6	36.3	2.89	3.4	2.5
Other(a)	7.5	65.1	8.66	2.0	4.4
Total	367.3	1,475.7	4.02	100.0	100.0

(a) Includes aviation gasoline, naphtha specialties, lubricating oils and greases, petroleum coke, alkylate and alkylate feedstocks

Source: D.B.S., Cat. No. 45-205

The pattern of Canadian refinery production in 1960 and 1967 is given in table 6; the products listed account for 81 to 84 per cent of the total volume of production in each region. The wider use of natural gas for heating in Western Canada probably is the major reason for the difference in production patterns between the regions west and those east of the Lakehead. The relatively greater demand for motor gasoline in Ontario and the Western provinces is the principal reason for the production of a larger proportion of light fractions in these regions.

Table 6: Regional Distribution of Refinery Production,
Showing Principal Fractions and Products,
1960 and 1967

Fraction	1960			1967		
	Quebec & Atl. Provs.	Ont.	Other Provs.	Quebec & Atl. Provs.	Ont.	Other Provs.
	- per cent of total volume produced -					
Gases	4.0	4.9	5.0	4.4	6.3	5.9
Light	35.8	43.0	46.3	34.9	44.2	47.6
Middle	34.6	32.1	31.3	34.2	28.2	32.8
Heavy	25.6	20.0	17.4	26.5	21.4	13.7
<u>Product</u>						
Gasolines(a)	32.6	35.3	43.6	30.7	37.3	43.9
Diesel fuel	8.2	7.1	16.1	8.0	7.3	21.0
Light fuel oil(b)	19.9	20.6	10.2	20.1	17.4	7.8
Heavy fuel oil(c)	21.7	13.3	11.1	22.7	18.1	8.6
Petrochemical feedstocks	1.0	5.1	0.5	2.4	2.8	0.1

(a) Includes aviation and motor gasoline

(b) Fuel oils No. 2 and 3

(c) Fuel oils No. 4, 5 and 6

Source: Derived from D.B.S., Cat. No. 45-204

In provinces west of Ontario, where organic chemical production is a very small proportion of the Canadian total and natural gas may be used in preference to liquid petroleum fractions for the production of organic chemicals, petrochemical feedstocks are of little importance as a market outlet for refinery products. Even in Ontario and Quebec (including the Atlantic Provinces), petrochemical feedstocks accounted for less than three per cent of refinery output in 1967.

Refinery Output -- Canada and Other Countries

The comparison of refinery output in Venezuela, Europe and North America, in table 7, shows the extent to which production patterns vary in different countries. These differences are striking not only between major areas but also between individual countries within regions.

The much greater relative importance of light distillates in Canada and the U.S.A. is readily apparent. It is also apparent that there are as significant differences between the patterns of production in Canada and the U.S.A. as there are between those of France and the Netherlands.

Where the demand requires large yields of heavy fractions, refineries can economize by using heavier, cheaper crudes in conjunction with relatively simple refinery equipment; where the demand is for a large proportion of light and middle distillates, refiners will try to avoid some of the costs of complex processing facilities by

using lighter crudes even though they are higher priced than heavy crudes.

Table 7: Comparison of North American, Caribbean and European Refinery Production, by Kind of Fraction and Principal Product, 1967

	<u>Venezuela</u>	<u>Nether-</u> <u>lands</u>	<u>France</u>	<u>Canada</u>	<u>U.S.A.</u>
	- per cent of total volume of crude processed -				
<u>Fraction</u>					
Gases	1.3	1.8	3.1	3.6	6.2
Light	11.8	11.1	20.6	36.0	51.4
Middle	17.1	37.7	42.2	35.1	24.5
Heavy	69.8	49.3	34.1	25.3	17.9
<u>Product</u>					
Motor gasoline	5.0	7.1	16.7	32.8	41.7
Gas diesel oil	15.9	26.1	39.7	28.4	21.3
Residual fuel oil	60.2	46.1	28.7	20.2	8.3

Source: O.E.C.D., Oil Statistics, 1967; Banco Central de Venezuela

The comparison of yields from different crudes, in table 8, indicates the variability in composition of crude oils. The lighter crude would yield a much higher percentage of combined light and middle distillates, the most valuable portions, and a much lower percentage of residual products. The yield of fractions from the heavier crude would be appropriate to supply a demand pattern such as exists, for example, in the Netherlands; the lighter crude would be more suitable for use by Canadian refineries.

Table 8: Comparison of Yields of Principal Petroleum Fractions from Typical Light and Heavy Crude Oils

	<u>Light Crude (Leduc)</u>	<u>Heavy Crude (Colombian)</u>
	- per cent of crude volume -	
Naphtha	36.0	15.0
Gas Oil	22.0	20.5
Lube distillate	11.8	16.4
Bottoms	23.9	47.3
Other (a)	<u>6.3</u>	<u>0.8</u>
	100.0	100.0

(a) Mainly gases

Source: Derived from Purdy, "Petroleum", p. 73

Because Caribbean and European demand is for large yields of heavy fuel oils most refineries in these areas do not require equipment for cracking heavier products. In contrast, North American refineries need large cracking capacities in order to achieve the yield of light products, particularly gasolines, which their market demands; this is evident in table 9.

Table 9: Comparison of Cracking Capacities of Canadian, U.S. and European Refineries

	<u>Quebec</u>	<u>Ontario</u>	<u>Total</u> <u>Canada</u>	<u>U.S.A.</u>	<u>Europe</u>
	-	per cent of	total crude	capacity	-
<u>Cracking capacity</u>					
Thermal	6.1	3.6	4.9	6.4	1.9
Catalytic	<u>31.2</u>	<u>28.7</u>	<u>29.8</u>	<u>36.3</u>	<u>7.1</u>
Total	37.3	32.3	34.6	42.7	9.0

Note: Canada and U.S.A. as at January 1, 1968; Europe as during 1966

Source: Canadian data from Operators List 5; U.S.A. data from U.S. Dept. of the Interior; European data from Frankel and Newton, Journal of the Institute of Petroleum, Vol. 54, No. 530, February 1968

International and Interprovincial Trade

Although appropriate combinations of crude oils and processes can be used to obtain almost any required product mix, the extent to which petroleum products are shipped interprovincially and internationally indicates that there are advantages in the exchange of products between regions and countries. Such trade may arise out of differences in the patterns of market demand in different regions, seasonal variations in the demand for particular products, or other factors.

Imports of petroleum products into Canada, in 1968, were 74 million barrels, the equivalent of about 203,000 barrels per day and represented about 16 per cent of Canada's total refining capacity. In part these imports augmented seasonal shortages of particular products. However, as the Department of Energy, Mines and Resources noted in its 1968 report on refineries in Canada, the level of imports also suggested a shortage of refining capacity in Central and Eastern Canada. (Operators List 5, January, 1968)

Imports into Quebec and the Atlantic Provinces were nearly 81 per cent of the total, Quebec, alone, accounting for 52 per cent. Imports into Ontario were 11 per cent and into British Columbia, 8 per cent of Canadian imports. It should be noted that imports into the Ottawa Valley are included in the Ontario total although this area is east of the NOP line and is served by Montreal refineries. The imports of petroleum products are, of course, additional to the imports of crude oil, which amounted to 178 million barrels, in 1968, valued at \$373 million.

Fuel oils are by far the largest part of the imports into all regions, two-thirds of the total volume of imports in 1968. The heavy, residual fuels, alone, constituted nearly one-half of all imports. These imported residual fuels cost less than crude oil and imports are ordinarily more than 50 per cent of the total consumption of these, in the region east of Ontario.

Table 10: Imports of Selected Petroleum Products,
by Region, 1968

	Imports			% of Total Imports		
	Ont.	Que.	Canada	Ont.	Que.	Canada
	- million barrels -			- per cent -		
Petrochemical						
feedstocks	0.5	-	0.5	5.7	-	0.6
Motor gasoline	*	3.6	4.5	0.4	9.4	6.1
Aviation turbo fuel	0.4	2.7	4.5	5.1	7.1	6.2
Kerosene, stove oil, & tractor fuel	0.3	1.7	3.7	3.9	4.5	5.0
Diesel fuel oil	0.5	3.3	7.8	6.3	8.7	10.5
Light fuel oil	2.6	5.4	13.2	31.8	14.0	17.8
Heavy fuel oil	1.7	18.9	34.2	20.8	49.4	46.4
Coke	0.4	2.0	2.5	5.5	5.3	3.3
Lube oils & greases	1.0	0.4	1.8	12.7	1.0	2.5
Other	0.6	0.2	1.1	8.0	0.7	1.5
Total Imports	8.0	38.2	73.7	100.0	100.0	100.0

Source: D.B.S., Cat. No. 45-004

The 74 million barrels of petroleum products imported in 1968 had a value of approximately \$165 million, of which \$55 million was heavy fuel oil, nearly \$57 million other fuel oils and kerosene, \$30 million motor gasoline, aviation gasoline and turbine fuels, and \$23 million cutting and lubricating oils and greases.

In 1968, imports into Quebec were 25 per cent of the consumption of petroleum products in the province. Thus, the current expansion of Quebec's refinery capacity is not surprising. Total imports into Quebec, in 1968, of 38.2 million barrels of products are equivalent to an average importation of approximately 105,000 barrels per day.

In total, the interprovincial shipments of petroleum products are of a similar order of magnitude as imports of petroleum products. In 1967, approximately 60 million barrels of petroleum products were transferred between provinces compared with total imports of petroleum products of 68 million barrels. Interprovincial movements of petroleum products are, of course, additional to the very large shipments of crude oil from western oilfields to eastern Canada; in 1967, these amounted to 112 million barrels.

The largest interprovincial movement involves the transfer of petroleum products from Quebec into Ontario. In 1967, the net transfer out of Quebec was 20 million barrels and net receipts in Ontario, inclusive of products from Quebec, the Atlantic Provinces and the West, was more than 27 million barrels. Part of these transfers would have been from Quebec into the Ottawa Valley area of Ontario, but a large part, 50 per cent of the total, was of motor gasoline and light fuel oil of which other parts of Ontario are also short.

Although Canada exports very substantial quantities of crude petroleum, its exports of petroleum products are small; in 1968, they amounted to less than 5 million barrels, of which more than half was shipped from British Columbia, and most of the remainder from Ontario, to adjacent areas in the U.S.A. Gasoline and various fuel oils made up most of the exports, but exports of naphtha specialties from Ontario were also significant and nearly 176,000 barrels of butane and butane mixes were exported from British Columbia.

Even with the planned refinery expansions it is probable that Eastern Canada will continue to import heavy fuel oils. These products are entered at 1/3 cent per gallon under item 26902-1, under both the B.P. and M.F.N. Tariffs. The available information suggests that it is more profitable for eastern refiners to continue to produce a relatively large proportion of light and middle distillate products than to undertake the production of large quantities of heavy fuel oil.

Imported Crude Oil Supplies

In order to conform with the National Oil Policy, refineries west of the Ottawa Valley use only Canadian crude oil; refineries east of it use imported crude oil, almost exclusively. In the context of the National Oil Policy (NOP), the western boundary of the "Ottawa Valley" follows certain designated township borders and is a line running roughly from west of Pembroke in the north to west of Brockville in the south. The part of Ontario which is east of this line includes many communities of fairly substantial size, such as Ottawa, Cornwall, Renfrew and Smiths Falls. The quotation from "Operators List 5" cited earlier, notes that refineries east of the NOP line are not permitted to supply areas west of the line with petroleum products apart from some products of which Ontario has seasonal shortages.

In 1968, Canada imported 178 million barrels of crude oil valued at \$373 million; all of this oil was for refineries east of the NOP line. In 1968, as in previous years, Venezuela was the principal supplier with 70 per cent of the total volume; middle eastern suppliers, mainly Iran and Saudi Arabia, accounted for 25 per cent of the imports (table 11).

Table 11: Imports of Crude Petroleum by Principal Region
or Country of Origin, Selected Years 1958-68

	<u>Venezuela</u>		<u>Middle East</u>		<u>All Countries</u>	
	mn. bbl.	\$ mn.	mn. bbl.	\$ mn.	mn. bbl.	\$ mn.
1958	72	200	30	69	104	274
1960	73	175	50	98	126	280
1962	85	208	45	88	135	305
1964	102	243	36	68	144	321
1966	72	166	51	89	146	299
1967	103	232	42	74	171	356
1968	124	279	45	77	178	373

Source: D.B.S., Trade of Canada, Imports, s.c. 264-10

The value of crude oil is determined mainly by its specific gravity; the sulphur content of the oil may also affect the price. Thus, a light crude, one with a high API number, is more valuable than a heavy crude, and a "sweet" crude (low in sulphur) is worth more than a "sour" crude. A light crude is more valuable than a heavy crude because its yield of the more valuable light fractions is higher; a sweet crude is more valuable than a sour crude because sulphur produces corrosive products during processing.

Crude oils vary greatly in specific gravity and other characteristics from region to region and oilfield to oilfield. Indeed, wells in the same oilfield may produce different kinds of crude oils. However, allowing for such variations, typical Venezuelan crudes imported into Canada are generally slightly heavy; middle east imports are lighter than Venezuelan and approach the specific gravity of the lighter Canadian crude oils; north African and Nigerian imports are usually of light crudes. Canadian crude oils are typically slightly lighter than middle eastern crudes but heavier than north African. African crudes usually have a low sulphur content; Canadian crudes are somewhat more sour than African; Venezuelan and middle eastern crudes are more sour than Canadian.

The average characteristics of crude oils imported into Canada from different regions are reflected in the unit value of imports; these are given in table 12.

Table 12: Unit Value of Imports of Crude Oil, f.o.b. Principal Country of Origin, Selected Years, 1958-68

	<u>Saudi Arabia</u>	<u>Iran</u>	<u>Venezuela</u>	<u>All Countries</u>
		- dollars per barrel	-	
1958	2.29	1.98	2.76	2.63
1960	2.30	1.93	2.41	2.23
1962	2.26	1.78	2.44	2.27
1964	2.32	1.80	2.37	2.23
1966	2.04	1.60	2.31	2.05
1967	2.09	1.56	2.25	2.08
1968	1.93	1.55	2.24	2.10

Source: D.B.S., Trade of Canada, Imports, s.c. 264-10

Most of the crude oil intended for Montreal refineries is pumped via the Portland-Montreal pipeline; the charge for the use of the pipeline is approximately 11 cents per barrel of light or medium crude. The shipping charge is dependent on the size of the vessel and the distance involved.

Tanker costs tend to be governed by an internationally recognized schedule of rates, the "Intascale" rate structure. Actual tanker costs vary, depending upon the state of the market for tanker services and are expressed as percentage discounts or premiums relative to the full Intascale rates.

During 1968 the average rate was about Intascale minus 30 per cent for tankers of up to 80,000 tons, on the Venezuela-Portland run. At Intascale minus 30 per cent the cost per barrel is approximately 22 cents; the comparable rate from Saudi Arabia (Ras Tanura) to Portland was \$1.02 per barrel. Of course, the 11 cent per barrel pipeline charge would have to be added to each of these. Thus, in 1968, the total average transportation cost to Montreal was approximately 33 cents per barrel from Venezuela and \$1.13 per barrel from Saudi Arabia.

Crude Oil Pricing

The determination of prices for crude oil is made difficult by the complexities of the commercial, institutional and governmental arrangements which impinge on the petroleum market. There is no shortage of published data on crude oil prices as "posted" by major producers but even the petroleum journals which publish these admit to their unreality, as descriptive of the price at which crude oil is actually changing hands. Thus the Petroleum Press Service reports that the price series which it publishes had

"become increasingly unrealistic, as market indicators since ... OPEC [the Organization of Petroleum Exporting Countries] got to work: because they [posted prices] have been relegated to the status of tax reference prices, the fact that they are static gives no clue to changes in the market conditions -- which are, however, reflected in the size of discounts ..."

(Petroleum Press Service, February, 1969, p. 42)

The taxes or royalties paid by oil companies are based on posted prices, hence, the mention of "tax reference prices".

The financial arrangements between branches or affiliates of an international oil company may also contribute to the unreality of posted crude prices in a situation in which each branch may be incorporated in a different country, each of which has different corporate tax structures. In such a situation it becomes profitable for the parent company to instruct its various subsidiaries to price products (and services, where a tanker fleet is involved) between themselves in such a way as to maximize the book profits of that particular subsidiary which is incorporated in the jurisdiction with the lowest corporate tax structure.

That this situation is applicable to the international petroleum industry appears to be acknowledged by the trade press of the industry. A recent book review states that

"Dr. Penrose concludes, not surprisingly, that the large international firm is less than perfect as an instrument for distributing the benefits of international investment. She points out that, in its legitimate desire to maximize its earnings overall, it may adjust its transfer prices so as to declare more profit in one country and less in another, thus inflating its tax payments in the former and reducing them in the latter."

(Petroleum Press Service, December, 1968, p. 442)

There was considerable argument, at the public hearing, regarding the prices at which crude oil could be purchased in world markets. Union Carbide contended that crude oil could be purchased at much lower prices than were paid by Montreal refineries if it were obtained in transactions at arm's length; the refineries denied this and insisted that they purchased their crude oil at the lowest prices available. (Transcript, Vol. 3, p. 438, 439; Vol. 7, p. 1033)

The Board was unable to resolve these differences of points of view. Most of the imported crude oil used by the refineries represented at the public hearing is purchased from parent companies but each refinery also purchased some of its foreign crude from companies with which it was not affiliated. The following statement made at a meeting of the Institute of Petroleum, in London, England, is relevant to the situation. The speaker commented that,

"The integrated sector of the oil industry is today so large, and consequently the scope for arms-length transaction so limited, that to look to the latter for an indication of real prices is to let the tail wag the dog."

(Journal of the Institute of Petroleum, February, 1968, p. 33)

A similar situation appears to obtain with respect to prices of full-range naphtha. Posted prices f.o.b. foreign ports tend to remain unchanged for long periods of time, two years or more in some cases and, in general, the trade press does not treat these as records of actual transactions.

The scarcity of published price information is particularly true in respect of the North American market, since on this continent, naphtha tends to be used by the refinery which produces it, in the making of the blended gasolines that are the most valuable output of North American refineries; for this reason no generally reported market price for naphtha is established on this continent.

THE SUPPLY OF PETROCHEMICAL FEEDSTOCKS

The petrochemical feedstocks most commonly used for the production of organic chemicals, in Canada, are refinery gases, naphthas and gas oils. To a much lesser extent, natural gas and liquefied petroleum gas are also used for this purpose, the former mainly in Western Canada.

Petrochemical feedstocks account for only a small part of the domestic disappearance of all petroleum products. In 1968, they were 2.9 per cent of the total disappearance in Quebec, 4.0 per cent of the total in Ontario and only 0.2 per cent of the total disappearance of petroleum products in the rest of Canada. The latter figure indicates the unimportance of petrochemical feedstocks to the refining industry, outside of Quebec and Ontario. Organic chemical production is concentrated in the Sarnia area of Ontario and in the vicinity of Montreal, and it is the producers of the so-called basic organic chemicals in these areas who create the demand for the petroleum products which are used as petrochemical feedstocks.

The very rapid growth in the use of petrochemical feedstocks between 1955 and 1964 is evident in table 13. The increase in use between 1964 and 1968 was only seven per cent, most of the expansion being in Quebec.

Table 13: Domestic Disappearance of Petrochemical Feedstocks in Quebec, Ontario and Canada, Selected Years 1955-68

	Domestic Disappearance			<u>Canada</u>
	<u>Quebec</u>	<u>Ontario</u>	<u>Other</u>	
		- thousand barrels -		
1955	315	1,379	345	2,039
1958	867	3,142	831	4,840
1961	1,329	3,991	688	6,008
1964	3,211	6,118	1,166	10,495
1965	3,305	5,713	1,577	10,595
1966	4,124	6,013	312	10,449
1967	4,660	6,565	451	11,676
1968	4,479	6,397	329	11,205

Source: D.B.S., Cat. No. 45-004

The consumption of petrochemical feedstocks in 1968 was equivalent, in Quebec, to approximately 12,300 barrels daily, and in Ontario, to 17,500 barrels of product per day. These quantities represented 3.1 per cent of the refining capacity in Quebec, and 5.0 per cent of that in Ontario, at that time. For individual refineries these figures would, of course, be different. For example, the Imperial Oil spokesman said, at the public hearing, that petrochemical feedstocks were about 10 to 12 per cent of the company's Sarnia refinery output. Because the Sarnia refinery complex is deeply involved in the production of chemicals, this would probably be the extreme figure. For some refineries sales of petrochemical feedstocks are negligible.

Based on information made available to the Board, it appears that about 80 per cent of the petrochemical feedstocks used in Ontario and Quebec in 1967 and 1968 were liquid petroleum fractions. Naphthas and other light liquids were about 54 per cent of the total use, and gas oils, about 23 per cent of the total; gases, almost entirely from petroleum refineries, accounted for the remaining approximately 24 per cent of petrochemical feedstocks used.

As the representations at the public hearing suggested, a large part of the gases and naphthas was for the production of ethylene with significant quantities of light liquids also being used in the production of BTX's. Gas oils were the heaviest liquid petroleum fraction reported. The petroleum feedstocks reported by Quebec plants were refinery gases, methane (from natural gas), and various light petroleum liquids. Full range naphtha was the principal liquid feedstock for the production of ethylene in Quebec (in Ontario it was gas oil) while a variety of products including pyrolysis naphtha and coke oven light oil were used to produce BTX's.

Up to the time of the public hearing, in March 1969, domestic supplies of petrochemical feedstocks for the production of organic chemicals appear to have been adequate and there appears to be no likelihood of shortages in the near future. Refinery capacity in the Montreal area is expected to increase by about 500,000 barrels of crude oil per day by 1971 and if petrochemical feedstocks continue to account for only 3.1 per cent of Montreal's refining capacity it would add 15,500 barrels per day of petrochemical feedstocks to the existing supply; if they were to account for five per cent of refining capacity, as currently in Ontario, the new capacity would add 25,000 barrels per day of additional feedstocks to the available supply.

The new refineries projected near Quebec City, Point Tupper, Nova Scotia and Come-by-Chance, Newfoundland, represent a total refining capacity of 260,000 barrels of crude per day. If three per cent of the output of these refineries were for the production of organic chemicals they would add another 8,000 barrels per day of feedstocks to the total supply. Thus, the additional supply of petrochemical feedstocks that could be expected as a result of the expansion of oil refining capacity east of Ontario is of the order of 24,000 to 33,000 barrels per day, even if there is no significant change in current production patterns.

At the public hearing, all parties agreed that there would be less refinery gas available to chemical plants in coming years. In addition, the new chemical plants coming on-stream or being planned, in Canada, are generally being designed to use a range of feedstocks including heavy gas oils. Thus, the outlook is that feedstocks such as refinery gases and LPG will become less important and that the heavier materials, particularly gas oils, will assume increasing importance.

In its report on Reference 120, the Tariff Board noted that

"under today's operating conditions a refinery may be equipped to turn out a range of products formerly considered the prerogative of a chemical plant. The distinction requires a more fundamental criterion, namely, differences between the products themselves ... a petrochemical not only must be derived from liquid petroleum or natural gas, but must also be of a purity sufficient to produce a predictable chemical reaction, a purity achieved in the later refining stages." (Ref. 120, Vol. 8, p. 15)

Thus, although it is convenient to refer to a "refining industry" and a "chemical industry", it is apparent that the line of demarcation between the two is necessarily indistinct. For example, an oil refinery may produce ethylene, benzene, toluene, and other organic chemicals while a manufacturer of organic chemicals may produce petroleum fractions as co-products of its operation.

Whether the plants in which the organic chemicals were produced were owned by a refinery or by a chemical company, they were usually built close to refineries in order to minimize costs of moving raw materials from refineries to chemical plants and of returning petroleum co-products from chemical plants to refineries. By minimizing storage requirements at both refineries and chemical plants, such arrangements were advantageous to both.

Petrochemical feedstocks are usually purchased on the basis of relatively long term contracts of two to five or even ten years duration, and involving the supply of a material described fairly precisely in the contract. Because the demand for petroleum products may vary substantially both seasonally and during the term of such a contract, a refinery could gain an advantage by operating its own chemical plants and thus be able to control, within fairly wide limits, the kind of feedstock which it would supply at any given time for the production of organic chemicals. These considerations in conjunction with the anticipated profits from the production of organic chemicals have resulted in the forward integration of many refineries into chemical production.

On the other hand a chemical plant which produced 500 million pounds of ethylene annually would require about 20,000 barrels of full-range naphtha per day as a raw material and would consume additional large amounts of fuel oil in its operations. Such a demand is equivalent to the output of a medium-sized refinery and by operating its own refinery, a chemical plant could acquire greater control over its supply of feedstocks. However, the more usual form of 'backward integration' by a chemical producer arises from the use of increasingly heavier petroleum fractions and producing therefrom increasingly large quantities of petroleum products in conjunction with the chemical products which are its primary objective. These developments have made it increasingly difficult to differentiate between a refinery complex which includes facilities for producing chemicals and a chemical plant which uses heavy liquid petroleum products as feedstocks.

In Canada, the forward integration of petroleum refineries is evidenced by the increasing output of organic chemicals by companies such as Imperial Oil and Shell. The backward integration of chemical plants is indicated by the design of the projected ethylene plant of Union Carbide which would allow it to process a wide range of feedstocks,

including gas oils. The new plant of Shawinigan Chemicals is similar in this respect to the projected Union Carbide plant with the additional feature of being integrated with the refinery operations of Gulf Oil, its parent.

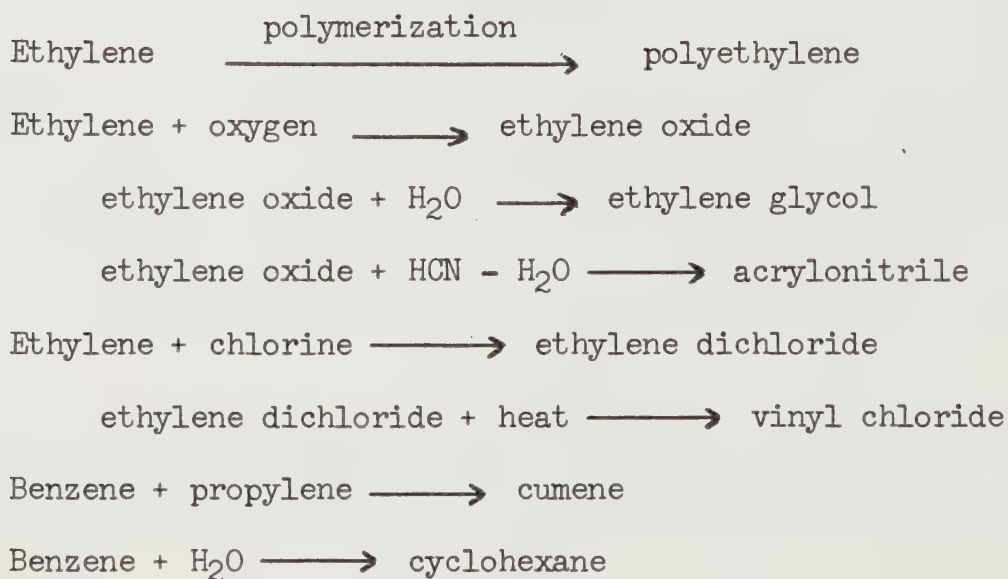
It should be noted that the ability of a chemical plant to use a variety of petroleum feedstocks is achieved at a substantial capital cost and there would have to be an anticipation of offsetting gains from the acquisition of feedstocks at lower prices, from the sale or use of the larger number of chemicals which would be produced, or from larger credits from the sale of petroleum by-products, to justify the additional investment. For example, where large quantities of naphtha are available at relatively low prices it would be of no advantage to an organic chemical plant to instal processing equipment which would enable it to use gas oils as well. However, such an investment might be attractive to an oil refinery which sought more complete control of its market for petroleum products.

THE DEMAND FOR PETROCHEMICAL FEEDSTOCKS

The demand for petrochemical feedstocks is a reflection of the demand for a relatively small number of what might be termed basic, organic chemicals. The demand for these organic chemicals, such as ethylene and benzene, in turn, reflects the demand for downstream products such as polyethylene or cyclohexane. The organic chemicals reported to the Tariff Board as being produced directly from petroleum products included ethylene, propylene, butylenes, butadiene, methanol, benzene, toluene and xylenes.

By far the most important primary products, in terms of volume, were ethylene and benzene; the principal organic downstream products reported were polyethylene, ethylene glycol, vinyl chloride, acrylonitrile, cumene and cyclohexane. The chemicals involved in the production of the principal downstream products reported are shown in table 14.

Table 14: Chemicals Used in Producing the Principal
Downstream Organic Chemical Products
Reported in Tariff Board Survey



Each of the two principal products, ethylene and benzene, is produced in conjunction with other products, and each requires petroleum feedstocks which are different in composition. The main co-products of ethylene are propylene, butylenes and butadiene; the co-products of benzene are toluene and xylenes. Ethylene and its co-products are produced from a variety of petroleum feedstocks including refinery off-gases, naphthas and gas oils, the principal requirement for an ethylene feedstock, apart from cost, being that it should contain paraffins which can be converted into the more reactive olefins, one of which is ethylene itself. To produce benzene and its co-products, the more desirable feedstocks are light fractions which are rich in aromatics.

In Canada, as elsewhere, the BTX's (benzene, toluene, xylenes) have customarily been produced in processing units which were part of petroleum refinery operations. Although the individual BTX's are sold as chemicals, large quantities are also used in the production of aromatic solvents and substantial amounts, particularly of benzene, are exported. A large part of the toluene production reported in the Tariff Board survey was converted into benzene.

Ethylene

In Canada, six companies were known to produce ethylene in 1968; each company operated only one plant. News reports suggest that two of these, Dow Chemical and Polymer Corporation, will go out of ethylene production and purchase their supplies from Imperial Oil. Dow, Polymer and Imperial are already connected by pipeline for the interchange of various chemical and petroleum products.

Only two of the six companies, Imperial and Shawinigan, sell ethylene. Imperial Oil sells ethylene to chemical plants in the Sarnia area and also exports some to the U.S.A. Shawinigan Chemicals informed the Board that it has sold ethylene to Union Carbide, in Montreal, for some years. The material purchased by Union Carbide is said to be largely high purity ethylene for the production of special grades of polyethylene.

Table 15: Producers of Ethylene in Canada, 1968

<u>Company & Location</u>	<u>Principal Feedstock</u>	<u>Est. Annual Capacity in million lb. of Ethylene</u>
C.I.L., Edmonton	natural gas	60
Dow, Sarnia	refinery & LP gas	80
Imperial Oil, Sarnia	naphtha, gas oil	150
Polymer, Sarnia	..	60
Shawinigan, Varennes	naphtha	120
Union Carbide, Montreal East	refinery gas, naphtha	<u>220</u> 690

Source: Various trade journals

The U.S.A. is by far the largest producer of ethylene in the world and currently produces about four times as much as either Western Germany or Japan, the two non-communist countries which follow in terms of annual production. Canada, whose output in 1968 approached 700 million pounds, ranks seventh among non-communist countries, after Britain, France and Italy.

Canadian ethylene plant capacities, in 1968, were small by U.S. standards, only 12 of 38 U.S. plants being comparable in size with those in Canada. The remaining 26 U.S. establishments were mostly considerably larger, each of five plants being large enough to supply the total Canadian market. About 80 per cent of the U.S. production is in the Gulf of Mexico area in Texas and Louisiana. The remaining 20 per cent is produced by 14 plants located in nine states; only five of these plants are within 500 miles of the Canadian border and they are generally comparable in size with Canadian plants.

The capacities of ethylene plants have been increasing for several years and currently few new plants are under construction or are projected, in the U.S.A., which have capacities of less than one-half billion pounds of ethylene; many of the new plants are of the order of one billion pounds or more. A similar trend is apparent in Europe. Of 17 plants for which contracts had been let in early 1968 only three had capacities of less than 200 million pounds and six had designed capacities of about one billion pounds or more of ethylene; the latter six plants represented approximately 80 per cent of the capacity under contract.

Canadian production of ethylene has been increasing rapidly in recent years. In 1968, the output of ethylene by Canadian producers was 88 per cent larger than in 1963 and amounted to 672 million pounds. At five cents a pound this output would be valued at \$33.6 million. However, most of the ethylene is used captively by its producers to manufacture such products as polyethylene, ethylene glycol (including anti-freeze preparations), acrylonitrile, vinyl chloride and many others and only a small part of the total is actually sold as ethylene.

The single most important use of ethylene is in the production of polyethylene in various forms such as films, pellets and granules; more than one third of the total Canadian output of ethylene is so used. In 1968, shipments of polyethylene by Canadian producers amounted to 235 million pounds, 51 per cent more than in 1963. At 16 cents per pound, 1968 shipments of polyethylene would be valued at \$37.6 million.

The second most important use of ethylene is in the production of ethylene glycol, a very large part of which is used in the manufacture of anti-freeze mixtures for motor cars. In 1962, the Canadian market for ethylene glycol for anti-freeze use was estimated to be approximately 80 million pounds per year. Based on motor car registrations, this market in 1968 would be about 110 million pounds. Other uses of ethylene glycol might increase the estimated Canadian consumption in 1968 to about 150 million pounds, the equivalent of approximately the same quantity of ethylene. Thus, ethylene glycol would have accounted for 22 per cent of ethylene production in 1968 and together with polyethylene would have represented 60 per cent of Canadian output in that year.

Other important, though lesser, outlets for ethylene are tetraethyl lead, vinyl chloride and polystyrene. In 1968, an estimated 132 million pounds of ethylene was used in the production of these products. The remaining 136 million pounds of ethylene are used in the production of other organic chemical products for which insufficient data are available to make similar estimates and some is exported to the U.S.A.

Ethylene does not enter into international trade in significant quantities but polyethylene resins, the principal products made from ethylene, are shipped internationally in large quantities. Canadian imports and exports of these resins are given in table 16.

Table 16: Imports and Exports of Polyethylene Resins, 1962-68

	Imports			Exports		
	million lb.	\$'000	¢ per lb.	million lb.	\$'000	¢ per lb.
1962	27.1	7,604	28.0	35.5	6,701	18.9
1963	22.4	5,332	23.8	39.0	6,327	16.2
1964	26.7	6,248	23.4	54.9	9,109	16.6
1965	30.4	6,766	22.3	36.1	5,901	16.3
1966	33.4	7,341	22.0	22.5	3,648	16.2
1967	49.2	9,922	20.2	25.8	3,863	15.0
1968	76.6	12,505	16.3	22.5	3,507	15.6

Source: D.B.S., Trade of Canada, s.c. 423-16

Imports of polyethylene resins, mostly from the U.S.A., have shown a pronounced upward trend in recent years, increasing from 30.4 million pounds in 1965 to 76.6 million pounds in 1968. This increase was accompanied by a decline in Canadian exports during the same period. It is important to note that imports and exports generally relate to essentially different products; this is reflected by the consistently large differences in unit values, both values being f.o.b. point of origin. The table suggests that, until 1966, most Canadian imports were of special grades of higher-priced polyethylene for particular applications. In 1967 and 1968, the data reflect some deficit in Canadian ethylene capacity and the production difficulties encountered by Imperial Oil at its Sarnia plant.

Imports of the glycol show no particular trend in recent years apart from unusually large imports in 1964 and 1965 which appear to have occurred as the result of special circumstances. Imports of polyethylene film and sheet have been increasing slowly since 1962. The value of imports of ethylene glycol and film and sheet, together, increased from \$2.8 million in 1962 to \$3.2 million in 1968; these imports represent the equivalent of about ten million pounds of ethylene.

The production of ethylene is accompanied by the production of large quantities of other products, mainly propylene, C4's (butylenes and butadiene) and, depending on the kind of feedstock used, fuel gas and certain petroleum products. Current data are not available regarding these products; however, the following estimates of

production, in 1963, have been published by the trade journal, Canadian Chemical Processing.

<u>Product</u>	<u>1963 Production in Million Pounds</u>
ethylene	358
propylene	82
butylenes	255
butadiene	220

If production of propylene and the C4's had increased at the same rate as ethylene, production in 1968 of propylene would have been 154 million pounds, of butylenes 479 million pounds and of butadiene 414 million pounds.

A large part of the butylenes are used for blending into gasoline and the principal use of butadiene is in the production of synthetic rubbers. Most of the propylene produced in Canada is blended into gasoline, but some is recycled to produce more ethylene, some is reacted with benzene to manufacture cumene and some is burned as fuel.

As Canadian demand for products made from ethylene increased, it was reflected in large expansions of Canadian productive capacity for ethylene. Early in 1969, Shawinigan Chemicals brought a new plant into production, at Varennes, near Montreal, whose designed capacity is 500 million pounds annually, and Union Carbide was assessing the feasibility of building a new plant with a similar capacity, in the same area. Imperial Oil also has expanded ethylene capacity at Sarnia to 500 million pounds per year.

The decisions to build plants of such a size reflects, in part, the expectation of a continuing rapid growth in the demand for ethylene products. However, it is unlikely that the Canadian use of ethylene will increase sufficiently in the next few years to absorb the more than one billion pounds of additional ethylene which these plants would be capable of producing. As a result, these plants will probably be brought to their designed capacity over a period of years, as the market for their output develops.

A major reason for the construction of ethylene plants of 500 million pounds capacity appears to be related more to the economies of scale of such plants than the prospects of being able to operate at full capacity in order to supply the foreseeable demand in the immediate future. This also appears to be the justification for building plants of 500 million to one billion pounds, or more, of ethylene capacity in other countries. Canadian Chemical Processing, discussing the outlook for polyethylene, comments as follows:

"Despite the recent round of resin price increases (ranging from 1 to 3¢/lb., depending on grade), the profit squeeze on domestic producers will continue. The excess of capacity over consumption [of polyethylene] worldwide is about three billion pounds, and 30% of that surplus exists next door in the United States."
(Canadian Chemical Processing, March 1969, p. 8)

Benzene, Toluene and Xylenes

Benzene is produced in Canada mainly by the petroleum refining industry; relatively small quantities are also produced as a by-product of steel production. The principal producers of benzene, in Canada, are Gulf Canada Limited at Montreal East, Imperial Oil at Sarnia, Regent (Texaco) at Port Credit, Ontario and Shell Canada Limited at Corunna, Ontario.

Benzene production and sales have been increasing very rapidly for several years with sales in 1968 of 525 million pounds, more than treble the estimated quantity sold in 1962. In addition, an estimated 130 million pounds was used captively in the production of intermediate organic chemicals and for other purposes. The Board estimates production in 1968 to have been about 655 million pounds, or 74.5 million gallons. At 32 cents a gallon (8.79 pounds), 1968 production would have had a value of approximately \$24 million and merchant sales a value of \$19 million.

The report on Reference 120 states that with the rapid expansion of production, Canada became a substantial net exporter of benzene in the early 1960's after having imported as much as 70 million pounds (eight million gallons) in 1958. Canadian exports to the U.S.A., in 1962, were about 105 million pounds valued at \$4.3 million; in 1968, they were 117 million pounds valued at \$4.0 million.

The principal uses of benzene are in the production of styrene, phenol and cyclohexane. The Board estimates that in 1968, 150 million pounds of benzene were used for the manufacture of styrene, 100 million pounds for cyclohexane and 90 million pounds for phenol. Thus, together with exports of 117 million pounds, these products would have accounted for 460 million pounds or 70 per cent of the estimated production in that year. The approximately 200 million pounds of output not accounted for would have been used to produce a variety of organic chemical products and aromatic solvents.

In Canada, most benzene is produced by the Platformer-Udex process in which process a petroleum fraction rich in aromatics is used as the feedstock. With severe cracking conditions and a suitable feedstock, a yield of 70 to 75 per cent of benzene can be obtained; by an appropriate choice of process conditions, all of the BTX's can be produced by this process.

A large part of the production of toluene is for use in aromatic solvents; some is also used to produce trinitrotoluene explosives and some may be blended into gasoline to increase its octane rating.

Three forms or isomers of xylene are of commercial importance, ortho-, meta-, and para-. The ortho- form is used to produce phthallic anhydride, an important constituent of alkyd paints; meta- xylene is converted into isophthallic acid which is then used in the manufacture of synthetic resins and plasticizers; and para-xylene is an important precursor of terylene (dacron). Like toluene, the xylenes may also be used for blending into gasolines or for the manufacture of aromatic solvents.

Methanol

Chemcell, which operates the only Canadian plant producing methanol from naphtha, was one of the two manufacturers of organic chemicals that appeared before the Board at the public hearing. However, the production of methanol is not an important factor with respect to the total demand for petrochemical feedstocks.

In Canada, methanol is manufactured by four companies in five plants. Chemcell and Imperial Oil are the two principal producers. The Chemcell plant at Edmonton and the Imperial plant at Montreal manufacture methanol from natural gas; the Chemcell plant at Cornwall uses a full-range naphtha as its feedstock. Two other companies were said to produce very small quantities of methanol as by-products. (Transcript, Vol. 4, p. 568)

In 1968, the total productive capacity in Canada was between 250 and 300 million pounds per year.

Table 17: Location and Size of Canadian Methanol Plants

<u>Company and Location</u>	<u>Feedstock Used</u>	<u>Est. Capacity in million lb. methanol</u>
Chemcell, Edmonton	natural gas	90
Cornwall	naphtha	80
Imperial Oil, Montreal	natural gas	80
Others, Sarnia & Millhaven	(a)	<u>..</u>
Total ^(b)		250-300

(a) Produced as a by-product

(b) Transcript, Vol. 4, p. 568

Source: Various trade journals

In Canada, methanol is used mainly in the production of formaldehyde; it is also used as a solvent in the coatings industry, as an additive to gasoline and in other minor ways. About two-thirds of methanol sales are for the production of formaldehyde, indicating an output of about 250 million pounds (31 million gallons), in 1968, an increase of more than 60 per cent from 1963. At five cents a pound (40¢ per gallon), this output would be valued at approximately \$12.5 million.

The three Canadian methanol plants would rank with the four smallest in the U.S.A. Most of the 16 plants in operation in the U.S.A. in 1968 had annual capacities exceeding 200 million pounds of methanol and seven of them, each, had capacities exceeding total annual Canadian requirements.

In 1966, the year before the Chemcell Cornwall and Imperial Oil Montreal plants came into production, Canada imported 16 million pounds of methanol, valued at \$452,000. Imports declined by almost one-half in 1967 and, in 1968, were only 0.6 million pounds valued at \$37,000. Until 1967, when the two new plants came on stream, exports were insignificant. In 1967, about 20 million pounds were exported and in 1968, exports were probably of the same order.

Probable Increases in the Demand for Feedstocks

In 1968, 4.5 million barrels (12,300 barrels per day) of petrochemical feedstocks were used in Quebec and 6.4 million barrels (17,500 barrels per day), in Ontario. These figures relate only to products of refineries and include refinery gas and LP gas produced in refineries. The Board estimates that the consumption of liquid petroleum fractions, alone, in 1968, was probably equivalent to 7,300 barrels per day in Quebec and 11,700 barrels per day in Ontario. These data reflect the production, mainly, of ethylene and its co-products, of benzene, toluene and xylenes, and of methanol.

The types of feedstocks used for the manufacture of ethylene and methanol are different from those used for the production of benzene and other aromatic chemicals. For the former, the principal requirement of a feedstock is that it should contain paraffins which are fairly readily convertible into olefins; for the latter, the desirable feedstock is a material which has a relatively high content of aromatic chemicals.

Thus, a wide variety of raw materials, from refinery off-gas to heavy gas oil, can be used for the manufacture of olefins such as ethylene, propylene and so on, but the choice of a feedstock suited to the production of the BTX's is relatively limited. Moreover, a feedstock suitable for the manufacture of BTX's costs very much more than one which could be used to produce ethylene; the former might be valued at about 20 cents or more a gallon compared with a value of 9 to 10 cents a gallon for a naphtha suitable for the production of ethylene.

Effect of Increased Ethylene and Methanol Production

Sometime in 1969 Imperial Oil will become the only producer of ethylene in Ontario and will supply former producers such as Dow and Polymer. When Imperial's output reaches the designed capacity of its ethylene plant, Ontario production will be 500 million pounds annually, an increase of 210 million pounds from 1968. However, in terms of the demand for liquid petroleum feedstocks it represents an increase of nearly 300 million pounds to allow for the ethylene previously manufactured, by others, from gaseous materials. This additional demand for petrochemical feedstocks is equivalent to about 12,000 barrels per day of a full-range naphtha or around 16,000 barrels per day of gas oil.

In Quebec, Shawinigan Chemicals has already brought its new 500 million pound ethylene plant into production, although not, as yet, at full capacity and Union Carbide may also build an ethylene plant of this size at Montreal. When these two plants are operating at their designed capacity, production of ethylene in Quebec will be one billion

pounds per year, 660 million pounds more than in 1968. Assuming that refinery gas will constitute part of the raw materials input of Union Carbide's new plant, the two new plants will represent an additional demand for liquid petroleum feedstocks equivalent to about 700 million pounds of ethylene per year. In terms of full-range naphtha this represents an additional demand for about 28,000 barrels per day.

No information is currently available regarding future increases in the production of methanol. However, even if production increased, it would have relatively little effect on the overall demand for liquid petrochemical feedstocks. Chemcell, at Cornwall, now requires about 900 barrels of naphtha daily to produce 80 million pounds of methanol per year. For example, if output increased by 50 per cent it would represent an increase in the demand for naphtha of less than 500 barrels per day.

Effect of Increased BTX and Other Production

In 1968, about 13,000 barrels per day of aromatic feedstocks were used in Quebec and Ontario, together, to produce BTX's; the production of BTX's is about the same in each province. Although a substantial growth is evident during the past decade, year to year changes in shipments of benzene tend to be erratic and it is, therefore, difficult to forecast probable increases in production. However, there appears to be optimism regarding further expansions in the production of these chemicals, at least partly because they and some of their derivatives can enter the U.S.A., without quota restriction, whether they are produced from domestic or imported crude oil.

The estimated production of benzene, the most important of the BTX's, has trebled in the past six years but a slower rate of growth is probable in the future. Assuming an expansion of about 15 per cent per year, the additional aromatic feedstocks which would be required by about 1971 would be of the order of 6,500 barrels per day in Quebec and Ontario. Most of these additional requirements, about 5,000 barrels per day, could be produced as co-products of the expanded ethylene production. The remaining requirements are unlikely to pose a serious problem for the refining industry.

In addition to the expansions already dealt with, it is reported that B.A.S.F., (Badische Anilin und Soda Fabric), of West Germany, is intending to produce polystyrene in the Montreal area, at the rate of 18 million pounds per year. Such a plant would use large quantities of both benzene and ethylene. It has also been announced that Commercial Alcohols Limited plans to produce 15 million gallons of ethyl alcohol, annually, at Montreal, using ethylene as a raw material; Canadian Chemical Processing estimates that such an output would provide a market for 80 to 90 million pounds of ethylene annually. Neither of these plants will affect the demand for feedstocks, directly, but both will provide a market for ethylene and benzene in the Montreal area. It is probable that the expansion of the Shawinigan Chemicals ethylene plant was predicated, at least in part, on the anticipated demand for ethylene that would be required by companies such as these.

Summary

In summary, it appears that in the coming three to five years, expanded production of organic chemicals, in the Montreal area, will require about 28,000 more barrels per day of petrochemical feedstocks; naphtha will probably be the preferred feedstock in this area. In Ontario, around Sarnia, increased production of ethylene and co-products will be reflected in a demand for 12,000 more barrels per day of naphtha or 16,000 more barrels a day of gas oil; gas oil appears to be the more likely feedstock in Ontario. Most of the anticipated expanded demand for aromatic feedstocks could be supplied by co-products of ethylene production.

If these estimates are even approximately correct, they indicate that by the early 1970's Quebec will have a larger demand for petrochemical feedstocks than Ontario, a very substantial change from the position in 1968. This is already indicated by the various plant expansions which have been reviewed in this section. In addition, the existence of supplies of basic raw materials in the Montreal area will probably attract other chemical producers; an indication of this trend is given by the announced plans of B.A.S.F. and Commercial Alcohols Limited, mentioned above.

In an earlier section it was estimated that, by 1971, expansions of refineries in the Montreal area would increase the available supplies of petrochemical feedstocks by 15,500 to 25,000 barrels per day; it was also estimated that the new refineries projected at other locations, east of Montreal, might add a further 8,000 barrels to the available supply. A comparison of these estimates with those relating to the probable increase in demand for such feedstocks indicates that there is no likelihood of shortages developing even if organic chemical production increases at a faster rate than has been assumed here. The expansion of refinery capacity in the Montreal area, alone, will probably be sufficient to supply the anticipated demand for petrochemical feedstocks east of the Ottawa Valley during the next few years.

THE PRODUCTION OF OLEFINS

The briefs submitted to the Board dealt, mainly, with various aspects of the production of ethylene and methanol. As the public hearing progressed, it became evident that ethylene and the petrochemical feedstocks used in its production were of principal interest. It became equally evident that the chemical and petroleum products which were an inevitable concomitant of the manufacture of ethylene were also important issues. It was soon apparent, also, that a plant which used liquid petrochemical feedstocks for the production of ethylene should be more correctly regarded as an olefins plant than as an ethylene plant.

Methanol production from liquid petroleum raw materials also involves the co-production of other chemical and petroleum products. However, in the production process used by Chemcell at Cornwall, in the only Canadian plant which uses liquid petroleum fractions to manufacture methanol, the naphtha feedstock is completely consumed in the production process.

Because of the emphasis placed on ethylene during the public hearing and also because ethylene is, by far, the most important basic organic chemical produced in Canada from petrochemical feedstocks, the following material applies to it. However, many of the generalizations in this section would apply also to methanol or, indeed, to any other organic chemical produced from liquid petroleum feedstocks.

Product Yields From Common Feedstocks

The principal petroleum feedstocks for the production of ethylene are natural gas liquids (ethane), naphthas and gas oils; table 18, which follows, shows typical 'once-through' yields from the steam cracking of such feedstocks. As the table indicates, the yield of ethylene decreases as heavier feedstocks are used. Thus, in order to obtain similar quantities of ethylene, about 20 per cent more light gas oil than naphtha and 34 per cent more heavy gas oil, must be used as a feedstock. The yield of residual product (C5+ over 400° F.) also increases with the use of heavier feedstocks, but the more valuable lighter portion of the C5+ fraction decreases when heavier feedstocks are used.

The yield of co-products from ethane is very small compared with the yields from other feedstocks. In fact, the widespread use of ethane for the production of ethylene, in the U.S.A., has resulted in a deficit of propylene and benzene, and thus, has provided Canadian manufacturers with a ready market for cumene, which is produced by the reaction of propylene and benzene.

Table 18: Typical Yields from the Steam Cracking
of Various Petrochemical Feedstocks

	<u>Ethane</u>	<u>Full-Range Naphtha</u>	<u>Light Gas Oil</u>	<u>Heavy Gas Oil</u>	
	-	per cent of weight of all products			-
Fuel gas	16.1	17.2	11.4	10.0	
Ethylene	76.2	31.2	26.3	23.3	
Propylene	2.9	16.1	15.1	14.3	
C4 Fraction, total	1.9	9.0	8.9	8.4	
Butadiene	1.3	4.5	4.0	4.0	
Butylenes	0.6	4.5	4.9	4.4	
C5+ Fraction, total	2.8	26.4	38.4	43.9	
up to 400° F.	2.8	21.9	15.2	13.8	
over 400° F.	-	4.5	23.2	30.1	
	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	

Source: Derived from Exhibit 1.1, Transcript, Vol. 1, p. 98A

The disposal of the co-products resulting from the use of liquid petrochemical feedstocks may pose a problem because unless a company can use or sell these products so that the average returns represent substantially more than their value as fuel, their production may be uneconomic. For example, propylene may have a value of

about 3.5 cents a pound as a chemical but less than one cent a pound as fuel. In the absence of either captive or merchant outlets at the premium values for a substantial proportion of the co-products, the economies of using a process or raw material which gives rise to them dwindle rapidly. On the other hand, a producer of a wide range of chemicals or one which is located near other chemical producers to which the co-products can be sold, may find it very profitable to use processes and materials which yield a wide range of products, and to undertake the additional investment and operating expenses which their production entails.

Most of the propylene produced in Canada is now combined with butylenes to produce gasoline alkylate, a high octane gasoline component. When used in the production of alkylate the constituents need not be of the purity of chemicals; the propylene shown in table 18 is of chemical grade and would be used for chemical production.

The C₄ fraction is a mixture of chemicals which contain four carbon atoms and includes mainly butadiene and butylenes. This fraction has a ready market either as the mixture or as the separated, individual chemicals. Polymer Corporation requires very large quantities of butadiene for the production of synthetic rubber and can readily convert butylenes into butadiene. A refinery which had the equipment necessary for the separation of the C₄'s might prefer to sell the butadiene and to retain the butylenes for conversion into gasoline alkylate.

The percentage yields of propylene and C₄'s are not very different for the liquid petroleum feedstocks shown in the table. However, because much larger quantities of heavier feedstocks are used to produce the same quantities of ethylene, the amounts of propylene and C₄'s produced as co-products are much larger for a given ethylene output when heavy gas oil instead of naphtha, is the feedstock. The fuel gas listed in the table is almost entirely methane and is typically used only as a fuel.

Thus, apart from the significant differences in yields of ethylene, the principal difference between naphtha and gas oil feedstocks is in the yield of the C₅+ fraction. From naphtha the yield of C₅+ is 26.4 per cent, almost as large as the yield of ethylene; the yield of C₅+ fraction from gas oils is much greater than the yield of ethylene.

The C₅+ fraction may be separated into the petroleum fractions shown in table 19; ethane is not included because, in the context of this reference, it is not an important feedstock for ethylene production. In any event, the C₅+ yield from ethane is less than three per cent.

The residual portion of the pentanes plus fraction, which boils at more than 400° F., would ordinarily be used as a heating fuel. When naphtha is the feedstock, additional fuel is required for processing. However, although fuel requirements for processing gas oil are larger than for naphtha, a plant using a gas oil feedstock would produce considerably more residual fuel than it required. (Transcript, Vol. 1, p. 96)

Table 19: Yields of Petroleum Products from the
Pentanes Plus Shown in Table 18

	Full-Range <u>Naphtha</u>	Light <u>Gas Oil</u>	Heavy <u>Gas Oil</u>
	-	'000 metric tons	-
Original Feedstock Input(a)	1,453.4	1,724.0	1,944.0
Total C5+ fraction	384.5	661.8	854.0
B.P. 400° F. & up (residual)	65.5	400.6	585.9
Max. B.P. 400° F.	319.0	261.2	268.1
Aromatic	175.5	130.6	134.1
Non-aromatic	143.5	130.6	134.0

(a) Sufficient for the production of one billion pounds of ethylene

Source: Derived from Exhibit 1.1; Transcript, Vol. 1, p. 98A

The lighter part of the pentanes plus has a maximum boiling point of 400° F., about the same as a full-range naphtha. More of this material is produced from naphtha than from gas oils. The non-aromatic portion can be recycled or it can be used as a gasoline blending stock. The aromatic portion is valuable because it is a common feedstock for the production of benzene, toluene and xylenes. For manufacturing BTX's the aromatic portion would be fractionated and a 'heart cut' would be removed for feeding into the BTX unit. The light and heavy 'ends' which had been removed could be recycled; the yield of BTX's from the heart cut would be about 70 to 75 per cent.

Thus, as heavier raw materials are used, increasing amounts of products other than ethylene are produced. Where the principal objective is the production of ethylene, the lighter the raw material that is used, the less the concern regarding the disposal of other products. Disregarding the off-gas, the yield of ethylene would be 38 per cent from naphtha, 30 per cent from light gas oil and 26 per cent from heavy gas oil.

The yield of petroleum co-products varies not only with the kind of raw material used but also with the severity of the processing conditions to which it is subjected. As the severity increases so does the yield of ethylene. At the same time the yield of pentanes plus declines sharply and that of fuel gas increases. The yield of ethylene may be only 20 per cent under mild conditions and nearly 30 per cent under severe conditions.

The Cost of Producing Ethylene -- Some Considerations

It is not intended, in this section, to try to establish the cost of producing ethylene in Canada. There is a very extensive literature on this subject dealing with differences in size of plant, kinds of feedstocks, varieties of processing conditions and many other variables. The purpose of the following paragraphs is merely to draw attention to some of the more important factors, relevant to this study, which affect the cost of producing ethylene.

Because of its importance as a raw material for further chemical processing, many plants are still being built primarily to produce ethylene. In the U.S.A., where ethane is the principal raw material, the co-products account for only about eight per cent of the output of such a plant; where liquid petroleum feedstocks are the raw materials, co-product production and disposal is a very important consideration in the design of an ethylene plant.

When a full-range naphtha is the raw material, the principal co-products contained in the C4 and C5+ fractions account for 35.4 per cent of the total output (table 18). As the preceding discussion has indicated, these products are, generally, too valuable to be used as fuel, although they could easily be burned in the plant's furnaces. In usual practice they are used as feedstocks for the production of other chemicals.

Each additional stage of processing increases the complexity of the chemical plant and the investment required. The additions are generally separate units distinct from the ethylene production unit even though they may receive feed materials directly from it; in fact, although the various plants are some distance from each other they may still be connected by pipeline.

Because ethylene is usually the primary reason for the construction of such plants, the convention is customarily adopted of deducting the value of co-products from the total costs of production. This convention is not inappropriate when ethane is used as a feedstock. However, when liquid petroleum feedstocks are used as the raw material and some of the C4's and C5's are processed further and sold as chemicals, the value of the co-products may be so large that this method of accounting attributes a negative cost to ethylene.

The effect of co-product credits on the calculated costs of producing ethylene from various feedstocks is illustrated in table 20. This table is typical of such tabulations.

It is apparent, from the table, that the cost of producing ethylene is least affected by the credits from co-products when ethane is the feedstock and is most affected by them when gas oil is the raw material. Because co-product production becomes increasingly larger as heavier liquid petroleum fractions are used as raw materials, it becomes increasingly important for a plant using heavier fractions to dispose of co-products in the form of chemicals, either through captive use or merchant sales. Indeed, unless such a plant could dispose of a substantial part of them at premium values, production of ethylene would rapidly become unprofitable.

The ability to dispose of a large proportion of the co-products at premium values presupposes the existence of a highly developed chemical industry with sufficient demand for a large variety of primary and intermediate organic chemicals to absorb the quantities of co-products with which large scale ethylene production is associated. Various public announcements and information given to the Board suggest that such a demand is evolving rapidly in Canada. However, at present the use of liquid petroleum feedstocks for ethylene involves the transfer of significant quantities of co-products to refineries instead of

to other chemical plants. For example, apart from the very recent announcement of a polypropylene plant at Sarnia, there is as yet, no major chemical use for propylene in Canada, other than the production of cumene.

Table 20: Costs of Manufacturing Ethylene From Various Feedstocks in a Plant With a Capacity of One Billion Pounds per Year of Ethylene

	Feedstock Used			Gas Oil
	Ethane	Naphtha	Naphtha ^(a)	
		- million dollars -		
Capital investment	25.6	30.2	30.2	32.4
		- cents per gallon -		
Cost of feedstock	2.7	6.5	7.5	8.6
<u>Costs</u>		- million dollars -		
Feedstock	10.8	32.9	38.1	99.3
Other direct costs	7.0	10.3	10.3	11.6
Indirect costs	<u>3.3</u>	<u>3.9</u>	<u>3.9</u>	<u>5.2</u>
Total	<u>21.2</u>	<u>47.1</u>	<u>52.3</u>	<u>116.1</u>
<u>Credits</u>				
Fuel gas	1.2	2.4	2.4	4.8
Propylene	0.7	13.8	13.8	27.0
Butylenes & butadiene	0.6	10.3	10.3	29.2
Pentanes plus	<u>0.4</u>	<u>7.0</u>	<u>7.0</u>	<u>70.2</u>
Total	<u>2.9</u>	<u>33.5</u>	<u>33.5</u>	<u>131.2</u>
Net costs ^(b)	18.2	13.6	18.8	-15.1
		- cents per pound -		
Net cost, ethylene	1.8	1.4	1.9	-1.5
Cost all products	1.7	1.6	1.8	1.3

(a) Column added to show effect on the calculation of one cent per gallon increase in the cost of naphtha

(b) Costs minus credits

Source: Derived from Robert Stobaugh, Oil and Gas Journal, October 1966, p. 143-57

Thus, naphtha is likely to remain the preferred liquid feedstock for ethylene production, for some years. The yield of co-products (other than off gas and over 400° F. pentanes plus) from naphtha is in a ratio of 0.7 pounds of co-products for each pound of ethylene; the corresponding yield from gas oil is 3.8 pounds of co-products for each pound of ethylene. As a result, a much larger demand for a much greater number of chemicals must exist to justify the use of heavier liquid feedstocks by an ethylene (olefins) plant.

As the preceding suggests, consideration must be given to a large number of variables in making a decision respecting the design of an ethylene plant. Although no special mention is made here of the costs of investment, it is obvious that the kind of feedstock and the conditions under which it is intended to be processed will have a direct bearing on these costs.

However, although the subject is very complex, one point which stands out in any examination of the very extensive literature is that the cost of the feedstock is the most important factor affecting the cost of producing ethylene and its co-products. The cost of naphtha as a raw material appears to range from about 70 to 80 per cent of the total costs of production and in general, the lighter the raw material the less is its percentage of the total cost of production. For example, the ethane in table 20 was 56 per cent of the cost of production; gas oil was 86 per cent of the total cost.

Table 21 has been prepared from a variety of sources, but mainly from papers presented at meetings of chemical engineers and similar professional groups. Each of the papers from which data were extracted dealt with ethylene production as its principal subject and each presented cost data for the production of ethylene and its co-products from liquid petroleum feedstocks.

Although the composition of the feedstocks varied and the conditions of processing were different, the percentage of the total cost of production represented by the cost of the naphtha varied from 70 to about 80 per cent of total costs. Moreover, considering the number of variables represented by the studies which were examined, the ratio of the cost of the feedstock to the total cost of production of all products was in a relatively narrow range.

Table 21: Cost of Feedstock as a Percentage of
Total Costs of Producing Ethylene and
Co-Products, Selected Studies

<u>Annual Capacity of Plant</u> mn. lb. ethylene	<u>Kind of Feedstock</u>	<u>Cost of Feedstock</u> ¢ per gal.	<u>Cost of Feedstock As % of Total Costs</u> per cent
500	naphtha	9.40	80.4
1,000	naphtha	6.75	74.3
500	naphtha	9.20	77.1
1,000	naphtha	6.50	73.0
500	naphtha	9.55	69.9
1,000	ethane	2.70	55.7
1,000	gas oil	8.64	85.6

Source: Derived mainly from papers presented to professional societies of chemists and engineers

TARIFF CONSIDERATIONS

The Proposals

The two tariff items which are relevant to this Reference are 26901-1 and 26902-1. As noted in the introduction to this report, this Reference relates to these items only with respect to petroleum fractions for use as feedstocks in the manufacture of organic chemicals. The two tariff items are reproduced below.

		<u>B.P.</u>	<u>M.F.N.</u>	<u>General</u>
Products of petroleum, n.o.p.:-				
26901-1	Lighter than .8236 specific gravity (40.3 A.P.I.) at 60 degrees Fahrenheit			
	per gallon	3/4 ct.	1 ct.	2 cts.
26902-1	.8236 specific gravity (40.3 A.P.I.) or heavier at 60 degrees Fahrenheit			
	per gallon	1/3 ct.	1/3 ct.	1 ct.

Union Carbide Canada Limited and Chemcell Limited proposed that products classified under these two items should be free of duty when entered for use as petrochemical feedstocks for the manufacture of organic chemicals.

Union Carbide proposed that a new tariff item, worded as follows, should be inserted into the Customs Tariff.

"Fractions of petroleum, imported by manufacturers of organic chemicals, for use in the manufacture of organic chemicals enumerated in 92901 and 92904. B.P. free M.F.N. free General free" (Transcript, Vol. 1, p. 29)

The wording of this proposed tariff item was discussed at some length during the course of the public hearing and the company presented an alternative wording and indicated that it, too, would be acceptable. The company's spokesman felt that the original intent of Union Carbide would still be conveyed if the wording were changed as indicated below:

"Fractions of petroleum otherwise classifiable under Tariff Items 26901-1 or 26902-1 when imported as feedstocks for use in the manufacture of organic chemicals enumerated in Tariff Items 92901 and 92904." (Transcript, Vol. 2, p. 213)

Heading 92901 relates to hydrocarbons; heading 92904 relates to acyclic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives. A spokesman for Union Carbide informed the Board that it included reference to heading 92904 in its proposal because methyl alcohol is classified in it; Union Carbide would otherwise not have included a reference to heading 92904 in its proposed item. (Transcript, Vol. 2, p. 231).

Chemcell also proposed the adoption of a new tariff item; in its brief, the company submitted the following wording:

"Petroleum fractions when imported for use as feedstocks in the manufacture of organic chemicals.
B.P. free M.F.N. free General free" (Transcript, Vol. 4, p. 557)

The proposals of the two chemical producers were opposed by five oil refining companies which urged that there be no change in the tariff status of petroleum fractions regardless of their intended use. They were:

Gulf Oil Canada Limited	Toronto
Imperial Oil Limited	Toronto
Newfoundland Refining Company Limited	Montreal
Petrofina Canada Limited	Montreal
Shell Canada Limited	Toronto

The Government of Alberta, in a written submission to the Board after the public hearing, supported the oil refiners.

Analysis of Proposals

Tariff item 26901-1 applies to relatively light products of petroleum such as aviation and motor gasolines, aviation turbine fuel, naphthas (including naphtha specialties), kerosene and light fuel oil. Item 26902-1 applies to products of a specific gravity of .8236 or more and, therefore, to heavier products like diesel and tractor fuel, gas oils and heavy fuel oils. In general, the products classified by item 26901-1 have a higher unit value than those of item 26902-1. A tabulation of the principal imports of petroleum products under tariff items 26901-1 and 26902-1 is given in table 22, showing the ad valorem equivalent of the existing duty; the imports shown in the table account for the total imports in 1968 entered under these items.

Table 22: Imports of Selected Petroleum Products
in 1968, Showing Ad Valorem Equivalent
of Existing Specific M.F.N. Duties

Product and Tariff Item	Quantity mn. gal.	Value \$'000	Unit Value ¢ per gal.	Ad Val. Equiv. of M.F.N.
				Spec. Duty p.c.
<u>26901-1</u>				
Aviation gasoline	4.7	949	20.1	5.0
Motor gasoline	145.9	15,818	10.8	9.3
Aviation turbo fuel	170.1	13,168	7.7	13.0
Naphtha ^(a)	4.9	1,393	28.5	3.5
L.P.G.	14.4	2,010	14.0	7.1
<u>26902-1</u>				
Diesel & tractor fuel	212.5	17,886	8.4	4.0
Kerosene & gas oil ^(b)	74.9	6,611	8.8	3.8
Fuel oil no. 1	138.2	12,369	9.0	3.7
Fuel oil no. 2 & 3	482.0	37,925	7.9	4.2
Fuel oil n.e.s.	1,130.2	54,539	4.2	7.9

^(a) Mainly highly refined naphtha specialties

^(b) More than 85 per cent is entered under 26902-1, the remainder under 26901-1

Source: Derived from D.B.S. data

At the public hearing, it was generally agreed that the price of a full-range naphtha and a gas oil, the two principal liquid fractions which might be used as petrochemical feedstocks, would be approximately the same in foreign markets. There was also general agreement regarding prices of naphtha in Europe at that time; Union Carbide gave a range of 7.2 to 7.5 cents a gallon and Gulf Oil a range of 7.1 to 7.8 cents a gallon. The price of naphtha in the Caribbean, 7.45 cents a gallon, used by Union Carbide in various submissions, was also not seriously questioned. Thus, if 7.5 cents a gallon is taken as the cost of foreign naphtha and gas oil, the one cent per gallon M.F.N. duty on naphtha would be equivalent to 13.3 p.c. ad valorem and the one-third cent a gallon duty which would apply to gas oil would be equivalent to 4.4 p.c. ad valorem.

The tabulation of imports under tariff items 26901-1 and 26902-1 indicates that in ad valorem terms, the nominal rates of M.F.N. duty under both items are low or moderate. Aviation turbo fuel is the only product entered under item 26901-1 which is dutiable at more than 10 p.c. on the basis of ad valorem equivalence and the only other product whose ad valorem rate approaches 10 p.c. is motor gasoline. Apart from residual fuel oil, whose unit value is very low, none of the other identifiable products imported under tariff item 26902-1 are dutiable at even five p.c. in terms of ad valorem equivalence.

Thus, in relation to the ad valorem equivalent rates which apply to other products under item 26901-1, the existing M.F.N. rate of duty on petrochemical naphtha is comparable only to those on motor gasoline and aviation turbo fuel. However, whereas both of the latter products are end products and are of considerable importance to the petroleum refining industry, petrochemical feedstocks constitute a very small proportion of refinery output in Montreal, the area which would be mainly affected by any change in the rates applicable to such products, and an even smaller proportion of the revenue of these refineries because of their relatively low unit value.

In an earlier section it was estimated that the demand for liquid petrochemical feedstocks in Quebec, exclusive of gases whether or not liquefied, in 1968, was about 7,300 barrels per day and that chemical plant expansions in the next few years would generate an additional demand for about 28,000 barrels per day in that province. Thus, the total demand for petrochemical feedstocks, in Quebec, in the early 1970's would be for about 35,300 barrels per day.

However, only a part of this additional demand would be involved in arm's-length transactions. The additional feedstocks required by Shawinigan Chemicals involve an intra-company transfer, as do the additional feedstocks which will be required for the production of BTX's. Thus, it is the requirements of Union Carbide's proposed new ethylene plant which will generate the additional market demand for liquid petrochemical feedstocks.

Should Union Carbide's proposed plant come on stream, in the early 1970's, it would probably depend mainly on a full-range naphtha feedstock. At the public hearing, it was claimed that if naphtha feedstocks could be imported free of duty this would result in a decline of about one cent a gallon in the price of naphtha. Such a

decline would represent an annual savings of about \$2.5 million to Canadian purchasers of naphtha for use as petrochemical feedstocks; it would, of course, represent a loss of revenue of the same order to Montreal refineries. To the extent that Montreal refiners do not take full advantage of the existing tariff, the amount involved would be less.

Imperial Oil will be the only company in Ontario whose production of 'basic' organic chemicals will be reflected in a significant demand for petrochemical feedstocks. It is unlikely that the company will purchase these from others and, therefore, its additional requirements will affect only its own operations. If the company wished to obtain petrochemical feedstocks from its Montreal refinery or to import them it would be free to do so. However, in order to conform with the National Oil Policy any petroleum co-products which were produced would have to be returned to the region east of the NOP line if they were not consumed captively. Of course, these provisions would apply to others as well.

Representations

Many points of disagreement arose between the purchasers and sellers of petrochemical feedstocks during the course of the public hearing. A large number of these involved a variety of technical matters, some of which were not directly relevant to the present study; the sections which follow will deal with those which are related to the principal issues involved.

Submissions by the Purchasers of Petrochemical Feedstocks

In support of its proposals, Union Carbide Canada Limited presented the following arguments.

1. If the Canadian petrochemical industry is to survive and compete with foreign chemical companies, new large scale plants must be built in Canada. (Transcript, Vol. 1, p. 33)
2. Such large scale facilities cannot be economically justified unless the raw materials which they require are available in Canada at prices which are comparable with those paid by producers of organic chemicals in other countries. (Transcript, Vol. 1, p. 14, 19, 33)
3. Canadian purchasers of fractions of petroleum for the production of ethylene and its co-products are now at a disadvantage relative to producers in other countries because whether they buy these feedstocks domestically or import them, the price they pay is, in effect, the laid-down cost of the imported material inclusive of the duty. (Transcript, Vol. 1, p. 28, 30, 64, 69)
4. An increase of one cent a gallon in the cost of naphtha (the existing M.F.N. rate under item 26901-1) is reflected in an increase of approximately one-half cent a pound in the cost of producing ethylene. (Transcript, Vol. 1, p. 28)

5. The effect of higher costs of producing ethylene is to increase the cost of producing polyethylene, ethylene oxide and other ethylene derivatives. As a result, it is becoming increasingly difficult for the company to compete with foreign producers who are in a position to take advantage of both economies of scale and relatively low-cost feedstocks. (Transcript, Vol. 1, p. 17, 33)
6. Canada is the only industrialized country which imposes a significant duty on ethylene feedstocks, a duty, moreover, which is greater than that imposed on most major ethylene derivatives. Such a tariff structure constitutes a disincentive to the expansion of production of ethylene and its derivatives, in Canada, is contrary to the treatment accorded competing producers in other areas of the world, and is inconsistent with other sections of the Customs Tariff. (Transcript, Vol. 1, p. 26)
7. The existing tariff items which would apply to the petroleum fractions generally used for the production of organic chemicals were introduced at a time when there was no Canadian production of organic chemicals from such materials. At the time of their introduction these tariff items were intended to provide protection for Canadian-produced energy products. (Transcript, Vol. 1, p. 34)
8. East of the Ottawa Valley, the integrated petroleum refinery-organic chemical plant operation has a competitive advantage over an unintegrated chemical producer as a result of the existing tariff structure. An integrated operation, in this area, obtains its raw materials, crude oil, free of duty and therefore, the internal transfer price of naphtha to its chemical plant can reflect the duty-free position of imported crude oil. However, the arm's-length sales price of naphtha to a non-affiliated chemical company need not reflect any such benefit, since the alternative for such a chemical company is to import naphtha and pay the existing duty under Tariff Item 26901-1. (Transcript, Vol. 1, p. 33)

Chemcell Limited took a generally similar position to that of Union Carbide. In its submission to the Board the company's spokesmen introduced the following additional arguments for free entry for the relevant petroleum fractions.

1. Canadian producers of organic chemicals are at a disadvantage to producers in other countries because of the relatively small size of the Canadian market and its geographical dispersion. (Transcript, Vol. 4, p. 552)
2. If the Canadian industry is to develop on an appropriate scale so that it will be capable of competing in the domestic and foreign markets it must be relieved of burdens such as are constituted by the existing tariffs on petrochemical feedstocks. (Transcript, Vol. 4, p. 553)

3. The company expects to purchase its supplies of petroleum fractions from Canadian refiners whether or not these materials can be entered free of duty. However, if Chemcell buys naphtha from domestic suppliers, as at present, it cannot obtain a duty drawback on exported products made from that naphtha even though its price reflects the existing duty. (Transcript, Vol. 4, p. 553, 554)

In its submission, the company, like Union Carbide, claimed that the existing tariff on petrochemical feedstocks gave an advantage to integrated refinery-chemical operations. Its spokesman also said that the tariff items under review were designed to provide protection for motor fuels and heating oils which were and are the overwhelming bulk of Canadian refineries' production and that the items were enacted long before these materials were used, as at present, for the production of organic chemicals. (Transcript, Vol. 4, p. 554-7)

Submissions by Petroleum Refiners

The principal arguments presented by petroleum refiners opposing any changes in the wording or rates of duty of tariff items 26901-1 and 26902-1 are presented in the following in the order in which they were submitted to the Board at the public hearing. As in the case of the representations by the purchasers of petrochemical feedstocks, some of the arguments were repeated in the various submissions.

Gulf Oil Canada Limited opposed changes in the relevant items on the following grounds.

1. When liquid petroleum fractions are used for the production of ethylene large quantities of other petroleum products are co-produced and, depending on the raw material used, from 40 to 60 per cent of the input will be petroleum products. (Transcript, Vol. 4, p. 641)
2. The large amounts of petroleum products which might be produced from duty-free naphthas or other petroleum feedstocks may be marketed as petroleum fractions. (Transcript, Vol. 4, p. 641)
3. The retention or removal of the existing duties under tariff items 26901-1 and 26902-1 would not affect the volume of Canadian organic chemical production from feedstocks which would be classified in these items, nor the prices of organic chemicals. (Transcript, Vol. 4, p. 643-4)
4. Government policy should be directed toward securing large scale co-ordinated operations, which can produce the lowest cost petroleum and chemical products for upgrading in Canada. (Transcript, Vol. 4, p. 644)
5. The submission of Union Carbide appears to take the position that there should be no tariff protection for the primary manufacturing operations performed by a manufacturer in Canada, if another company wishes to start its manufacturing processes part way along the line and perform only the latter portions of a total manufacturing operation. (Transcript, Vol. 4, p. 650)

6. The nature of the petroleum industry is such that there are recurring surpluses in various regions of the world, leading to offerings at distress prices. Therefore, there is a need for protection by Canadian refiners. (Transcript, Vol. 4, p. 652)
7. The Canadian petroleum refiner suffers from certain disabilities and, in consequence, has been provided with tariff protection. These disabilities include the higher cost of construction in Canada and the climatic problems which require storage facilities to take care of large seasonal changes in demand. It is the general problem of climate and geography as well as markets. (Transcript, Vol. 5, p. 779)

Imperial Oil also opposed the proposals of the purchasers of petrochemical feedstocks. The company's major arguments are summarized below; those arguments which were covered in the Gulf submission are not repeated.

1. The existing rates of duty which apply to petroleum products are the minimum rate appropriate to permit the Canadian refining industry to do business in an economic and efficient manner. In today's market they offer at best no more than minimum protection to the domestic industry. (Transcript, Vol. 6, p. 832)
2. Erosion of the tariff protection afforded the petroleum industry by the application now before the Board would encourage the use of imported chemical feedstocks at the expense of the market demand for domestically refined product. (Transcript, Vol. 6, p. 833)
3. Depending on the process chosen and the severity of the operation for the manufacture of chemicals, by-products are made which could readily be diverted into the petroleum market in the form of duty-free gasoline, naphthas, fuel oils, etc., in direct competition with these domestically produced products, thereby eroding the effectiveness of the petroleum tariff still further. (Transcript, Vol. 6, p. 834)

Shell Canada Limited supported the position taken by the other oil refining companies; its principal arguments in support of its proposals are listed below.

1. The petrochemical industry is an important outlet for the company's products, and to this end it is concerned that reduction or elimination of the duty on imported petroleum products will deny the petroleum refiner an important outlet for its product. (Transcript, Vol. 6, p. 931)
2. Products of petroleum refining are priced on the basis of their ability to compete in a free, competitive market. It is, therefore, unrealistic to assume that the removal of the tariffs on petroleum products would result in a lowering of feedstock prices. If anything, the reverse situation could apply in that imports of products by displacing domestic production would lead to lower output from the refineries and, hence, higher unit costs. (Transcript, Vol. 6, p. 932)

Petrofina Canada Limited also opposed duty-free entry for petrochemical feedstocks, giving the following principal reasons for its opposition.

1. The rates of duty under tariff items 26901-1 and 26902-1 provide a necessary minimum rate of protection to the domestic oil refining industry. The removal of the duty would encourage the use of imported chemical feedstocks to the detriment of domestically refined products. (Transcript, Vol. 6, p. 975)
2. There has been no demonstrable evidence that any such action would result in any corresponding benefits to the consumer or to the user of chemical products in Canada. (Transcript, Vol. 6, p. 975)

The submission of Newfoundland Refining Company Limited added the following arguments in opposition to the proposals of Union Carbide and Chemcell.

1. If new and expanded plants are to operate in a balanced condition, it is necessary for them to sell products in approximately the same volumes that they manufacture them. If the Canadian tariff on naphtha were to be reduced and imports of foreign naphtha were to follow, sales of the valuable naphtha fraction would be denied Canadian refiners. (Transcript, Vol. 7, p. 1004)
2. The nature of the output of European refineries constitutes a competitive threat to the Canadian market in respect of light distillates such as feedstock naphtha. (Transcript, Vol. 7, p. 1004)

ANALYSIS OF REPRESENTATIONS

Petrochemical feedstocks are a very small part of the consumption of petroleum products in Canada. In 1968 they were 2.9 per cent of the total in Quebec, 4.0 per cent of the total in Ontario and only 0.2 per cent of the consumption in the rest of Canada. In terms of refinery capacity, consumption of petrochemical feedstocks was 5.0 per cent of the total in Ontario and 3.1 per cent of the total in Quebec.

In 1968, 8.4 million barrels of liquid petrochemical feedstocks were used in Quebec and Ontario. When the new plants of Imperial Oil and Shawinigan and the projected plant of Union Carbide are operating at designed capacity, consumption of liquid feedstocks in Quebec and Ontario will be three times as large, about 24.5 million barrels annually; at \$3.40 a barrel, they would be valued at \$83.3 million.

Adequacy of supplies of domestically-produced petrochemical feedstocks was not an issue in this Reference; in commenting, the Union Carbide spokesman said

"... it is perfectly clear from the evidence ... that ample supplies of naphtha petrochemical feedstocks will ... be offered in Eastern Canada if a demand for it develops."
(Transcript, Vol. 7, p. 1035)

Also, the probability of the actual importation of petrochemical feedstocks if the duty was removed was not an important issue during the public hearing.

The central issue throughout the public hearing was the effect of the existing tariff on prices of petrochemical feedstocks produced in Canada; directly related issues concerned the probable consequences of duty-free entry of these feedstocks on producers of organic chemicals who purchased such materials and on Canadian refiners who manufactured and sold them. The spokesman for Union Carbide noted that a 500 million pound a year ethylene plant operating at full capacity would consume 250 million gallons of naphtha per year. He said that the present M.F.N. duty on naphtha, under tariff item 26901-1, is one cent a gallon and would be reflected in the selling price of domestic naphtha and, therefore, that the additional cost to an operator of an ethylene plant of such a size would be \$2.5 million per year. (Transcript, Vol. 1, p. 63, 64)

A spokesman for Gulf Oil agreed that the potential value of the removal of the duty to chemical producers would be the same as the dollar loss to petroleum refiners. (Transcript, Vol. 5, p. 823, 824)

Effect of Existing Tariff on Prices of Naphtha

Throughout the hearing, the discussions of petrochemical feedstocks related almost exclusively to naphtha. This was probably because it was anticipated that naphtha would be the most important liquid feedstock even though both Shawinigan's and possibly Carbide's plant would be capable of using gas oils.

The Caribbean and northwest Europe were cited as the two probable sources of foreign petrochemical naphtha, if it were to be imported into Canada, the Caribbean being the more probable. Union Carbide's spokesmen claimed that naphtha could be purchased in the Caribbean at 7.45 cents a gallon, and could be delivered in Montreal at a total cost of approximately 8.55 cents a gallon. (Transcript, Vol. 3, p. 352) These prices f.o.b. the Caribbean and Europe were not seriously questioned at the hearing and the Board has confirmed that the prices and the transportation charges included would be reasonably representative. The cost of taking delivery from dockside and storing sufficient product to provide for the period during which the St. Lawrence is closed to navigation would add only a small fraction of a cent per gallon.

Thus, if one cent per gallon, the M.F.N. rate of duty under item 26901-1 is added, the cost of imported naphtha delivered to the Union Carbide plant at Montreal would be slightly more than 9.55 cents per gallon. Several exchanges during the public hearing indicated that most, if not all, Montreal refineries appear to price naphtha at approximately the delivered, duty-paid cost of imported naphtha. (Transcript, Vol. 3, p. 363; Vol. 6, p. 950; Vol. 7, p. 997, 998)

However, although the evidence indicated that the existing tariff results in higher prices for petrochemical feedstocks than would otherwise obtain, it is not clear what proportion of the available protection is involved. For example, if Union Carbide were to

import naphtha it would have to arrange for dock facilities and rights-of-way for a pipeline from the dock to its plant, a distance of about three miles. In addition, the company would incur the cost of building a pipeline, and storage facilities to provide for the four months of the year when the St. Lawrence is closed to navigation. Thus, it is probable that Union Carbide would be prepared to pay more than the laid-down cost of foreign naphtha in order to avoid such costs and inconveniences and to have its supply of naphtha guaranteed by a known, neighbouring supplier.

The Threat of Sales at Distress Prices

The threat of imports of petrochemical feedstocks purchased abroad at distress prices was cited during the hearing as a reason for retention of the existing duties on petroleum fractions for use in the manufacture of organic chemicals. However, an organic chemical plant operates continuously and could not depend on distress sales for its supply of raw materials. As was made clear at the hearing, such a plant would arrange for supplies of raw materials in contracts which would ordinarily relate to periods ranging from two to five years or more.

The Issue of Co-Products of Chemical Production

How an ethylene (olefins) plant like that planned by Union Carbide might dispose of the petroleum co-products which it would inevitably produce was discussed at considerable length during the hearing. The oil companies viewed the petroleum co-products which would result from chemical plant operations as a competitive threat. Imperial Oil expressed this viewpoint in the following terms.

".... of serious concern to the industry, is the disposition of by-products arising from the processing of duty-free feedstocks by the chemical producers. Depending on the process chosen and the severity of the operation for the manufacture of chemicals, by-products are made which could readily be diverted into the petroleum market in the form of duty-free gasoline, naphtha, fuel oils, etc., in direct competition with these domestically produced products thereby eroding the effectiveness of the petroleum tariff still further." (Transcript, Vol. 6, p. 834)

As noted in an earlier section, a chemical plant which is designed to produce ethylene from liquid petroleum fractions is more accurately described as an olefins plant. Such a plant would produce the products shown in table 18 from the respective feedstocks listed. Using the basic data in table 18, the yields of the various petroleum fractions from a full-range naphtha and a heavy gas oil, would be as follows.

	Full-Range Naphtha	Heavy Gas Oil
	- % of total output -	-
C4 fraction, total	9.0	8.4
C5+ fraction, total	26.5	43.9
Aromatic to 400° F.	12.1	6.9
Non-aromatic to 400° F.	9.9	6.9
C5+ residual, over 400° F.	<u>4.5</u>	<u>30.1</u>
Total	35.5	52.3

Thus, it is clear that a large part of the output of an olefins plant consists of petroleum fractions. However, the refining companies were concerned not so much that petroleum fractions would be produced by such a plant but that these would enter the fuel market in competition with petroleum products produced by refineries. The petroleum fractions which could enter into market competition with such refinery products consist mainly of that part of the C5+ residual which was not used in the production of petrochemicals nor as fuel in the plant's processes. Apart from these residual fuels, most of the remainder would be converted into chemicals. This, in fact, was the position taken by Union Carbide at the public hearing. The company claimed that 93.4 per cent of a full-range naphtha and 81 per cent of a heavy gas oil, would be converted into chemicals. (Transcript, Vol. 1, p. 98b, 98c; Vol. 7, p. 1068-1073)

The underlying issue was that the potentially competitive petroleum co-products of an olefins plant might be produced from duty-free feedstocks. The Imperial Oil spokesman was clear in this respect when he said "by-products are made which could readily be diverted into the petroleum market in the form of duty-free gasoline, naphthas, fuel oils, etc." (Transcript, Vol. 6, p. 834) In this connection, it is interesting to note the parallel claim by Union Carbide that "the internal transfer price of naphtha to a refiner's own chemical plant can clearly reflect the duty-free position of imported crude oil." (Transcript, Vol. 1, p. 32)

The Effect of the Tariff on the Cost of Producing Ethylene

In the comparison of costs of producing ethylene from various feedstocks, shown in table 20, co-product credits are based on chemical or premium values. In Canada there is, as yet, insufficient demand for some of the co-products, as chemicals, to warrant such treatment. Therefore, the principal product of such a plant, ethylene, must bear a larger proportion of the total costs of production in Canada than it does, for example, in the U.S.A.

In table 21 the cost of naphtha was shown to be between 70 and 80 per cent of the total cost of production in an olefins plant; these total costs apply to the total output of such a plant and include ethylene and all of the co-products combined. The studies from which these data were obtained suggest that for a change of one cent per gallon in the cost of naphtha the cost of producing ethylene would change by .42 to .60 cents per pound. Therefore, if prices of naphtha are increased by one cent a gallon, as a result of the existing

tariff, then the costs of producing ethylene in Canada would be increased by about one-half cent a pound.

Effect of Free Entry on Refineries

If Union Carbide constructs a 500 million pound per year olefins plant, the maximum loss of revenue to the refining industry from duty-free entry of petrochemical feedstocks enumerated in item 26901-1 would be \$2.5 million. By 1975, when the proposed plant of Union Carbide would probably be operating at capacity, the maximum loss of revenue to Quebec refineries represented by free entry of liquid feedstocks would be about 0.3 per cent of their total revenue at that time.

To the extent that heavier petroleum fractions than naphtha will be used in the future, the maximum loss would be less because the heavier petrochemical feedstocks would be entered under tariff item 26902-1 at 1/3 cent per gallon, M.F.N. Although about one-third more gas oil than naphtha would be required to produce an equal amount of ethylene, the maximum loss to refineries from duty-free entry of heavier fractions for petrochemical use would be less than one-half of that resulting from the use of naphtha.

The Situation in Ontario

All of the Ontario refineries are west of the Ottawa Valley and, therefore, use only domestic crude oil which costs about 50 to 70 cents a barrel more, delivered at Sarnia, than comparable grades of imported crude delivered at Montreal. (Transcript, Vol. 6, p. 865) The cost of crude oil is a very large part of the total cost of producing petroleum products and, therefore, petrochemical feedstocks would cost more to produce in Ontario than in Quebec. However, Canadian companies which use domestic crude oil are exempt from U.S. quotas on imports of petroleum or petrochemical products whereas those using imported crude are not. (Transcript, Vol. 5, p. 750, 751) To some extent, the ability to export such products to the U.S.A. offsets the disadvantage of higher-cost crude. (Transcript, Vol. 6, p. 866)

If petrochemical feedstocks could be imported free of duty, imports into Ontario would be by way of the St. Lawrence Seaway and would be limited to eight months of the year, from mid-April to mid-December. Ships would probably unload some of their cargo at Montreal in order to be allowed to enter the Seaway and, taking into account the additional costs of unloading at Montreal (or of using smaller tankers), storing feedstocks for a period of four months and transportation from Montreal, there would, apparently, be no clear financial inducement to import petrochemical feedstocks into the Toronto or Sarnia areas.

It would appear that the combination of the relatively large scale of operations of Imperial Oil, at Sarnia, opportunities for exportation to the U.S.A. and the ability to dispose of a large proportion of its ethylene co-products for premium uses, offsets most of the disadvantage of higher raw material costs. The company sells ethylene in the Sarnia area at prices which are comparable with those of Montreal producers, in spite of the higher cost of the crude which it uses. The fact that the price paid by Ontario refineries for crude oil is less than that paid by U.S. refineries is also an advantage for a company which exports to the U.S.A. In its brief, the company said

"Our major concerns are the return of duty-free petroleum fractions into the petroleum fuels market ..."
(Transcript, Vol. 6, p. 837)

Petrochemical Feedstocks -- the Case for Protection

Two general types of liquid petroleum fractions are used as chemical feedstocks in Ontario and Quebec: the aromatic fractions from which chemicals such as benzene, toluene and xylene are produced, and the paraffin types such as naphtha and gas oil from which the olefins (ethylene, propylene, et cetera) are produced.

Because benzene, toluene and xylenes, the principal aromatic chemicals, would be free of duty when imported into Canada, any change in the rates of duty on the aromatic feedstocks used in their production would have little, if any, effect on those companies which produce it for sale or use it in their chemical operations. Canada is an exporter of both the aromatic fraction and the chemicals made from it. Thus, the liquid petroleum fractions mainly affected by the proposals of Union Carbide and Chemcell would be those which are used to produce olefins.

The principal effects of the retention or removal of the duties on liquid petrochemical feedstocks classified in tariff items 26901-1 and 26902-1 would be felt in the Montreal area. It is here that all of Quebec's refinery capacity is now concentrated and where most of the petrochemical feedstocks will continue to be produced in the near future; it is here, also, that almost all of the demand for petrochemical feedstocks produced in the province now exists and will continue to exist for several years, at least. As noted in the preceding section, to some extent, Ontario refineries are insulated from the effects of free entry of petrochemical feedstocks. In addition, the use of imported feedstocks for chemical production might affect the present position of Ontario chemical producers with respect to exports to the U.S.A.

The main issue related to the proposals for duty-free entry of petroleum fractions for the manufacture of organic chemicals was expressed by Gulf Oil in the following terms.

"The submission of Union Carbide appears to take the position there should be no tariff protection for a manufacturer in Canada in performing primary manufacturing operations, if another company wishes to start its manufacturing processes part way along the line and perform only the latter portions of a total manufacturing operation." (Transcript, Vol. 4, p. 650)

The quotation implicitly assumes that there should be tariff protection for petrochemical feedstocks; this view was also stated explicitly by Gulf Oil at various times during the hearing. (Transcript, Vol. 4, p. 652; Vol. 5, p. 779); the other oil refiners supported this position. (Transcript, Vol. 6, p. 832, 931, 975)

However, the mere fact that a product is manufactured in Canada is not, of itself, sufficient reason for assuming that it should be afforded tariff protection. Accordingly, the reasons why protection for petrochemical feedstocks is or is not needed by Montreal refineries are now examined.

Arguments by Refineries in Support of Protection

The oil companies supported their claims that they needed protection principally on the following grounds:

1. the scale of production is smaller in Canada;
2. costs of construction are higher in Canada;
3. the product mix produced by Caribbean and European refineries requires less complex equipment than that of Canadian refineries and, therefore, smaller investments are required for their construction;
4. there is a need, in Canada, for additional storage facilities because of seasonal climatic factors;
5. the demand for gasoline and similar light products is relatively smaller in Europe and the Caribbean than in Canada and protection is needed to prevent imports of the surpluses of these products available in these regions;
6. protection is required to prevent imports of products at distress prices.

The oil companies presented very little evidence to support their claims that they needed the protection afforded by the Customs Tariff with respect to the petrochemical feedstocks which are relevant to this study. This prompted the Chairman of the Board to draw their attention to the brevity of their submissions and the lack of factual material, on several occasions. (Transcript, Vol. 5, p. 741, 779, 797, 800) The following analysis of the refineries' arguments is based largely on published material; experts, including officers of oil companies, were also consulted.

It seems to be generally agreed that the costs of construction of similar refineries are lower in northwestern Europe or the Caribbean than in Canada; various sources suggest that such costs, in Canada, are from 10 to 15 per cent higher. It is also generally accepted that, apart from costs of construction, a smaller investment would be needed for a refinery typical of those in Europe or the Caribbean because it is less complex than the usual Canadian refinery. The lower construction costs and lesser complexity, together, could result in the total investment in Europe or the Caribbean being about 40 per cent less than in Canada, for a refinery having the same capacity in terms of crude oil throughput per day.

However, the simplicity of these foreign refineries is not necessarily a net advantage. It is true that costs of investment are less but revenues are also less -- very much less, in fact, because these simple types of refineries obtain relatively small yields of the more valuable lighter products (see table 7).

No attempt was made to assess the storage requirements in Canada and in other countries, arising out of seasonal changes in demand for petroleum products. However, it is unlikely that the Canadian situation is sufficiently different from that of northwestern Europe to be a significant factor. Storage requirements in the Caribbean area are probably also affected by seasonal changes in the demand, at least for its principal products, the fuel oils. For example, 78 per cent of Canada's imports of fuel oils are from the Caribbean and 63 per cent of the 46.1 million barrels which were imported in 1968, were entered in only six months, from July to December. The pattern of Canadian purchases is probably representative of those of other countries in the northern hemisphere.

The argument that large quantities of surplus light and middle distillates were currently available in the Caribbean and Europe and constituted a threat to Montreal refineries is not supported by the information available from a variety of sources, including statements made by spokesmen for the oil refineries. The discussion, at the public hearing, indicated that the matter of surplus supplies was basically a question of occasional sales mainly in the Caribbean, at distress prices; this question was dealt with in an earlier section.

Thus, the principal disadvantages of Montreal refineries appear to be higher costs of construction and of operation. However, these appear to be more than offset by the much higher total revenue from sales available to these refineries.

Advantages of Montreal Refineries

The scale of production, which was said to be a disadvantage of Canadian refineries, has not been discussed in the foregoing because the available evidence indicates that Canadian refineries probably are larger in scale of operations than refineries in most other countries; certainly this is true of the Montreal refineries.

In 1968, there were six refineries in Montreal; collectively, their total daily capacity was 400,000 barrels. Thus, the average capacity was about 67,000 barrels per day; the lowest actual capacity was that of Canadian Petrofina, 52,500 barrels per day. The average size of U.S. refineries at that time was 41,500 barrels per day; even in Texas, which had the largest refining capacity of any state, the average capacity per refinery was only 62,800 barrels per day.

During the public hearing, spokesmen for Gulf Oil and Imperial Oil informed the Board that a refinery with a capacity of 100,000 barrels per day could achieve most of the available economies of scale and that few economies were available after a capacity of 150,000 barrels per day was reached. (Transcript, Vol. 5, p. 816, 817; Vol. 6, p. 844, 847, 848) The Gulf Oil spokesman added that refineries usually achieve capacities beyond 150,000 barrels per day by adding repetitive sections. (Transcript, Vol. 5, p. 817)

The capacities of Montreal refineries are currently being substantially increased and a new refinery, with a capacity of 100,000 barrels a day, is being built near Quebec City. When the current expansion is completed, by about 1971, three of the six Montreal refineries will have capacities of about 100,000 barrels or more per day and the average capacity will be 78,000 barrels per day.

Thus, the Montreal refineries are comparable in size with refineries in the U.S.A. and, on average, are probably larger than refineries in most other countries; by 1971, they will rank with all but the very largest in the world. The total capacity, at that time, of about 500,000 barrels of crude daily, will make Montreal the site of one of the largest concentrations of refinery capacity in the world.

The Department of Energy, Mines and Resources refers to other advantages of Montreal refineries in the following terms.

"In Quebec, the refineries are located in an area immediately east of Montreal. Here, crude can be received either by overland pipeline ... or directly by tanker ... Thus these large and efficient refineries are not only in a position to take advantage of the most economic crude oils received from abroad but are located in the largest consuming region of the province with marine facilities to ship products to storage depots in the eastern part of Canada."
(Operators List 5, January 1968)

In summary, Montreal refineries enjoy the advantages of large scale operations, a highly concentrated market for their products and cheap transportation facilities for receiving crude oil and for distributing the products which they manufacture. As subsidiaries of some of the largest international oil companies in the world, they have access to the most advanced technological knowledge available. In addition, the crude oil which they use is imported free of duty and the products which they produce are sold in a protected market.

Effective Protection

The issue of the magnitude of the effective protection on naphtha was raised by Union Carbide during the course of the public hearing. The company contended that, although the nominal ad valorem equivalent of the one cent per gallon M.F.N. duty under tariff item 26901-1 was approximately 13 per cent, the effective protection was very much higher. (Transcript, Vol. 1, p. 78) In its simplest terms the effective protection is the net amount of duty per unit calculated as a percentage of the value added per unit, in manufacturing a product; a simple illustration of how the calculation is made follows.

An article which is valued at \$1.00 per pound and is dutiable at 10 p.c. would be subject to a duty of 10 cents a pound on importation. Assume that full advantage is taken of the tariff and the price in Canada is \$1.10 a pound. Assume, also, that the raw material from which this article is made can be entered free of duty and that the total cost of the raw material required to produce one pound of finished product costs the manufacturer 75 cents and that the only other input in the manufacturing process is electricity, which is also duty-free and costs five cents per pound of finished product. From these assumptions the value added in manufacturing would be 20 cents a pound; this is derived by subtracting the total cost of inputs, all duty-free, of 80 cents a pound, from the price, exclusive of duty, of \$1.00 a pound. The duty of 10 cents a pound, when applied to the value added of 20 cents a pound, would show the effective protection to be 50 p.c. although the nominal rate was only 10 p.c.

Union Carbide drew attention to a recent study made for the Economic Council of Canada, which reported that although the nominal tariffs on products of petroleum refineries averaged six per cent, the effective protection was about 33 per cent before the Kennedy Round and 37 per cent after. (Transcript, Vol. 1, p. 77) The Board made similar calculations relating only to the Montreal refineries and using much more detailed data than was available to the authors of the Economic Council study. According to the Board's calculations the effective protection enjoyed by Montreal refineries was approximately 50 per cent, in 1968, although the weighted average nominal rate was only 6.5 per cent (see table 23). The Board recalculated the effective rate of protection on the assumption that naphtha for use as petrochemical feedstocks could be entered free of duty; the effective rate of protection for Montreal refineries would then have been 47 per cent, three percentage points less.

Table 23: Effective Protection for Montreal Refineries,
1968, Computed on a Per Barrel Basis

	Value, Duty <u>Included</u>	Amt. of Duty <u>Included</u> \$ per barrel	Value, Duty <u>Excluded</u>
	-		-
Crude oil	2.588	-	2.588
Other chemicals, additives, etc.	.136	.009	.126
Containers & other shipping materials	.004	.001	.004
Fuel & electricity	.022	-	.022
Operating, maintenance & repair supplies	<u>.045</u>	<u>.004</u>	<u>.041</u>
(A) Total Value of Inputs	2.795	.014	2.781
(B) Total Value of Outputs	3.376	.207	3.170
Value added (B - A)	.581	-	.389

Effective protection =

$$\frac{\text{value added with duty} - \text{value added without duty}}{\text{value added without duty}} \times 100$$

$$= \frac{.581 - .389}{.389} \times 100 = 49.4 \text{ p.c.}$$

No attempt was made to calculate, precisely, the effective rate of protection on naphtha. This product does not require more than average processing and therefore would not have a greater value added than the average of all products. However, the nominal rate on naphtha is about 13 per cent and, therefore, the effective protection is considerably more than 47 per cent.

The Board also calculated the effective protection applicable to low density polyethylene and ethylene oxide, two of the principal products made from ethylene; the calculations were based on detailed engineering data. For low density polyethylene, the Board's calculations involved two alternative assumptions: the first, that the

existing M.F.N. rate of $7\frac{1}{2}$ p.c. for polyethylene, under tariff item 93902-3, would apply; the second, that the M.F.N. duty would be 10 p.c., the rate recommended by the Board in Reference 143. The results of the calculations are shown below.

Table 24: Effective Protection for Low Density Polyethylene and Ethylene Oxide, Manufactured from Light Naphtha

	<u>Polyethylene</u>		<u>Ethylene Oxide</u> ^(b)	
	<u>Duty</u> <u>Included</u>	<u>Duty</u> <u>Excluded</u>	<u>Duty</u> <u>Included</u>	<u>Duty</u> <u>Excluded</u>
- dollars per 100 pounds of end product -				
<u>Cost of Inputs</u>				
Naphtha	4.75	4.27	4.52	4.06
Other chemicals, etc.	.30	.26	.39	.34
Packaging materials	.14	.12	-	-
Operating & maintenance materials & supplies	.70	.63	.53	.47
Utilities	.97	.94	1.32	1.29
(A) Total Value of Inputs	6.86	6.22	6.76	6.16
<u>Total Value of Outputs</u> ^(a)				
<u>Polyethylene</u>				
(B) at 7.5 p.c. duty	21.09 ^(a)	19.70 ^(a)	-	-
(C) at 10.0 p.c. duty	21.51 ^(a)	19.70 ^(a)	-	-
(D) <u>Ethylene oxide</u>	-	-	16.65 ^(a)	14.72 ^(a)
<u>Value Added</u> (B - A)	14.23	13.48	-	-
(C - A)	14.65	13.48	-	-
(D - A)	-	-	9.89	8.56
<u>Rate of Protection</u>	<u>Nominal</u>		<u>Effective</u>	
Low density polyethylene	7.5 p.c.		5.6 p.c.	
	10.0 p.c.		8.7 p.c.	
Ethylene oxide	15.0 p.c.		15.5 p.c.	

(a) Includes value of ethylene co-products

(b) Air oxidation process

The Structure of the Relevant Canadian Tariff

In its brief, Union Carbide stated that

"Canada is alone in imposing a significant duty on ethylene feedstocks, a duty moreover which is greater than that imposed on most major ethylene derivatives ... such a tariff structure constitutes a gross disincentive to the expansion of production of ethylene (and its derivatives) in Canada, is clearly contrary to the treatment accorded competing producers in other areas of the world, and is inconsistent with sound principles of tariff-making ..." (Transcript, Vol. 1, p. 26)

In support of these claims Union Carbide submitted information regarding the rates of duty on petroleum fractions used for the manufacture of organic chemicals and the rates on ethylene and its derivatives, for a large number of countries. The Board has investigated these submissions and has established that the rates presented by Union Carbide were those that applied at the time of the public hearing.

The data indicated that only three of the countries included in the survey apply a duty or other tax on imports of liquid petrochemical feedstocks, Japan, the U.S.A. and Canada. The duty (or tax), in Japan and the U.S.A., is the same, 1/3 cent per gallon. In Canada, the products which are more frequently used as feedstocks are dutiable at one cent a gallon, M.F.N., under tariff item 26901-1; the less important feedstocks, at the present time, are dutiable at 1/3 cent a gallon under tariff item 26902-1.

The tariffs which apply to ethylene are ignored here, because, at present, transportation costs limit the international movement of this product to situations which involve relatively short distances. The following table shows the sequence of rates in several countries for the feedstocks and ethylene derivatives as they were at the time of the public hearing.

Table 25: Rates of Duty on Liquid Petrochemical Feedstocks and Certain Derivatives of Ethylene, Selected Countries, March 1968

	<u>Petroleum Fractions</u>	<u>Polyethylene Resin</u>	<u>Ethylene Oxide</u>	<u>Ethylene Glycol</u>
E.E.C. (a)	Free	16 p.c. (b)	15.8 p.c.	16.4 p.c.
Denmark	Free		Free	Free
Sweden	Free	9 p.c.	9 p.c.	9 p.c.
Gr. Britain	Free	10 p.c.	25 p.c.	25 p.c.
Japan	1/3¢/gal.	7.1¢/lb.	20 p.c.	20 p.c.
U.S.A.	1/3¢/gal.	2.4¢/lb. +16 p.c.	2.6¢/lb. +12 p.c.	2.6¢/lb. +12 p.c.
Canada	1¢/gal. 1/3¢/gal.	7.5 p.c.	15 p.c.	10 p.c.

(a) Benelux, France, Germany, Italy

(b) Imports from U.S.A. subject to special duty of 40 p.c.

Source: Transcript, Vol. 1, p. 51

As noted earlier, the more widely used petrochemical feedstocks, in Canada, are petroleum fractions which would be classified under tariff item 26901-1 at one cent per gallon, M.F.N. At 7.5 cents per gallon the ad valorem equivalent of the M.F.N. duty would be 13.3 p.c. This, as was claimed, would make the raw material dutiable at a higher rate than the polyethylene resin or the ethylene glycol; the resin and glycol account for about 60 per cent of the total consumption of ethylene in Canada.

SUMMARY AND CONCLUSIONS

In this Reference, the Board was directed to study and report on tariff items 26901-1 and 26902-1 in so far as they relate to fractions of petroleum for use as feedstocks in the manufacture of organic chemicals, in particular those primary organic chemicals derived directly from them. At the hearing, Union Carbide of Canada Limited introduced, and Chemcell Limited supported, a proposal for the insertion in the tariff of an end-use item which, as finally formulated, would permit the free entry of the petroleum fractions mentioned above when for use as feedstocks in the manufacture of the organic chemicals enumerated in tariff headings 92901 and 92904. This proposal was opposed by Gulf Oil of Canada Limited, Imperial Oil Limited, Shell Canada Limited and Petrofina Canada Limited which operate petroleum refineries; Newfoundland Refinery Company Limited, which proposes to build a refinery in Newfoundland, also objected to the proposal.

Union Carbide purchases refinery gas and naphtha for the manufacture, in Montreal East, of ethylene and its co-products as a step in the manufacture of certain of their derivatives; it is considering the construction of a large new ethylene plant designed to use naphtha or gas oils. Chemcell purchases naphtha from Montreal refineries for use in the manufacture of methanol (methyl alcohol) in its plant in Cornwall; it also produces methanol in Edmonton from natural gas.

The oil companies that opposed the proposal refine crude petroleum to produce gasoline and other refinery products including petroleum fractions which are, or may be, used as petrochemical feedstocks. Gulf Canada through its affiliated company, Shawinigan Chemicals Limited, also produces ethylene at Varennes, chiefly for captive use but also for sale to Union Carbide. Shawinigan Chemicals Limited has recently put on stream a large new plant designed to use gas oils as well as naphtha in the production of ethylene both for sale and captive use; the feedstocks are produced in the Gulf Canada refinery at Montreal East and shipped to the Varennes plant by pipeline. Imperial Oil produces ethylene in the Sarnia area from a variety of petroleum fractions, including naphtha and gas oils, both for captive use and for sale; in addition it produces methanol from natural gas in Montreal.

Refinery gas supplies a considerable proportion of the petrochemical feedstocks used in Ontario and Quebec but the rapid growth in the demand for ethylene derivatives has made necessary the increasing use of liquid petroleum fractions, especially naphtha. In 1967 and 1968, naphthas and similar light liquids comprised more than one-half of such feedstocks, by volume, while refinery gas and gas oils each comprised less than one-quarter. The production of benzene, toluene and xylenes (the BTX's) requires an aromatic fraction of petroleum quite different chemically from those used for ethylene or methanol; this aromatic fraction occurs in varying proportions as a co-product of ethylene production from liquid petroleum fractions.

Demand for petrochemical feedstocks reflects the demand for a relatively small number of basic organic chemicals which in turn are used in the production of a great variety of derivatives. The organic chemicals produced directly from petroleum fractions include ethylene,

propylene, butylenes, butadiene, methanol, benzene, toluene and xylenes. Of these the most important in Canada, in terms of volume, are ethylene and benzene. Ethylene production absorbs by far the largest proportion of the petroleum fractions used as feedstocks in the production of organic chemicals.

In 1968, ethylene was produced in Canada by six companies in six plants which ranged in annual capacity from 60 to 200 million pounds as compared with the newer plants in other countries which often possess annual capacities of 500 million to 1,000 million pounds or even more.

The plant of Canadian Industries Limited in Edmonton produced ethylene from natural gas rather than from liquid petroleum fractions; accordingly the plant is not of direct concern in this Reference.

In Sarnia, Imperial Oil produced ethylene for captive use and for sale, using naphtha and gas oil; Dow and Polymer each produced for captive use. It is expected that Dow and Polymer will discontinue production before the end of 1969 in consequence of the current expansion of Imperial Oil's facilities; Imperial Oil will then become the sole producer of ethylene in Ontario, with an annual capacity of 500 million pounds.

In Montreal, Union Carbide, with the largest capacity of the six Canadian plants, produced from refinery gas supplemented by naphtha, for captive use and purchased some ethylene as well. Early in 1969, Shawinigan Chemicals brought into operation, at partial capacity, a new 500 million pound ethylene plant designed to use naphtha or gas oil to produce for captive use and for sale.

When Imperial Oil's plant in Sarnia and Shawinigan's new plant in the Montreal area are in full operation, Canadian ethylene capacity will have increased from 690 million pounds in 1968 to some 1,280 million pounds.

Ethylene is a flammable gas, except at very low temperatures; it forms an explosive mixture with air, even at low concentration. In consequence, it is costly and hazardous to transport over long distances; normally it does not enter Canada's international trade in substantial amounts. However, many of its derivatives are internationally traded in large volume.

Of the derivatives of ethylene, the two most important are polyethylene in its various forms and ethylene glycol. The Board estimates that, in 1968, more than one-third of the total Canadian ethylene output of 672 million pounds valued at \$34 million was used in the production of polyethylene; more than 20 per cent, in the production of ethylene glycol; nearly 20 per cent, in the production of tetraethyl lead, vinyl chloride and polystyrene taken together; and the remainder, in the production of other organic chemicals.

Shipments of polyethylene resin by Canadian producers have been increasing for several years and in 1968 were 235 million pounds, 79 million pounds more than in 1963. Imports have also increased substantially in recent years, from 33 million pounds in 1966 to 77 million

pounds in 1968. Exports in 1968 were 23 million pounds, 13 million pounds less than in 1965.

The production of ethylene results also in co-products; these are relatively unimportant when natural gas or refinery gas is used as a feedstock but become significant in volume when naphtha is used and are still larger when heavier petroleum fractions are used. They usually include fuel gas, propylene, a C₄ fraction which contains butadiene and butylenes, and a C₅+ fraction composed of a lighter portion which can be separated into two constituent parts, one of which contains aromatic chemicals, and of a heavy residual portion.

Some of these co-products resemble certain of the fractions of petroleum produced in a refinery in the ordinary course of refining crude petroleum. Various, they may be used in the production of gasolines, or be recycled for further conversion into ethylene, or separated into single chemicals, or used or sold for use as a feedstock for further chemical production; the most profitable use will depend on the markets available to the ethylene producer. Generally speaking, the products are more valuable when they can be used in the chemical industry. A larger proportion of the co-products can be thus more profitably sold when the plant is part of a highly developed chemical complex or when it is situated in an area in which the petrochemical industry is highly developed.

Much of the co-product propylene, in Canada, has been combined with butylenes to produce alkylate, a component of high octane gasolines; it is also combined with benzene to produce cumene which can be imported into the U.S.A. free of duty. Plants are projected in Canada which will use propylene as a raw material for the production of polypropylene and other chemicals. Propylene is admitted into Canada free of duty under tariff item 92901-13. In the U.S.A., where most of the ethylene is produced from ethane, propylene is in short supply and plants are being constructed to produce propylene.

The C₄ fraction, which is a mixture principally of butadiene and butylenes, has a ready market either as it is produced or when separated into its chemical components. Polymer Corporation uses large quantities of butadiene in the manufacture of synthetic rubber; the butylenes, when separated, are used mainly in the production of gasoline alkylate.

The C₅+ (pentanes plus) co-product of ethylene may be separated into a lighter part and a heavier residual portion which boils only at temperatures in excess of 400° F. This residual portion, which is used as a fuel, is less than the plant fuel requirements when naphtha is used as a feedstock but greater when gas oils are used. The lighter portion of the pentanes plus may be further separated into an aromatic and non-aromatic fraction. The less valuable non-aromatic stock is recycled or used as a gasoline blending stock; the aromatic portion, or a cut from it, is commonly used as a feedstock in the production of the BTX's: benzene, toluene and xylenes.

Benzene is second only to ethylene among the basic chemicals derived from petroleum feedstocks. It is produced principally from aromatic petroleum feedstocks, some of which are obtained as a co-product in the production of ethylene. Small amounts of benzene are

also produced from coal-tar as a by-product of the steel industry. The principal producers of benzene are Gulf Canada Limited in Montreal East, Imperial Oil and Shell Canada Limited in the Sarnia area and Regent (Texaco) at Port Credit, Ontario. Production has increased rapidly; in 1968, it amounted to some 655 million pounds, or 74.5 million gallons, valued at some \$24 million dollars. Of this production, 130 million pounds was used captively and 117 million pounds was exported to the United States. When reacted with propylene it forms cumene, much of which is also exported.

The toluene may be used in the manufacture of explosives.

Of the isomers of xylene, one or another is used directly or as a precursor in the production of phthallic anhydride, alkyd paints, synthetic resins, plasticizers, and terylene.

The BTX's are used without separation in solvents and blended gasolines. If separated, they are admitted to Canada free of duty.

Most of the methanol or methyl alcohol, the other principal chemical mentioned in representations to the Board, is manufactured from natural gas by Chemcell in Edmonton and Imperial Oil in Montreal; in Cornwall, it is manufactured by Chemcell from naphtha purchased from Montreal refineries. In the Chemcell process, at Cornwall, the co-products are completely consumed within the plant. In 1968, the output of methanol in Canada was some 250 million pounds valued at \$12.5 million dollars, about two-thirds of which was used for the production of formaldehyde. In 1966, imports were 16 million pounds but, with the opening of the new plants of Imperial Oil in Montreal and Chemcell in Cornwall, they almost disappeared; exports in 1967 were some 20 million pounds and in 1968, were probably of similar magnitude. When imported into Canada, methanol would be subject to duties of 5 p.c. under the B.P. Tariff and 10 p.c. under the M.F.N. Tariff.

The producers of the petrochemical feedstocks which are relevant to this Reference are the petroleum refineries, a few of which also produce petrochemicals in plants integrated with their refinery operations.

The domestic disappearance of petrochemical feedstocks has increased from some two million barrels in 1955 to more than 11 million barrels in 1968, valued at about \$36 million. It was said, at the public hearing, that a plant producing 500 million pounds per annum of ethylene would require some 20,000 barrels per day, or more than seven million barrels per year, of a full-range naphtha as a feedstock and even more if a heavier petroleum fraction was used. Thus, when the new plants of Imperial Oil and Shawinigan Chemicals are operating at capacity, they will require nearly nine million barrels more of petrochemical feedstocks than these companies used in 1968. The construction of a new plant by Union Carbide would create an additional substantial demand for these products.

The use of such feedstocks is concentrated in Ontario, principally in the vicinity of Sarnia, and in Quebec, principally in the vicinity of Montreal. Of the 1968 disappearance, 4.5 million

barrels were used in Quebec and 6.4 million barrels in Ontario. These amounts represented 2.9 per cent of the total disappearance of refinery products in Quebec and 4.0 per cent in Ontario.

In 1969, the refinery capacity in Quebec was 400,000 barrels per day and in Ontario 357,000 barrels per day. All six Quebec refineries are located immediately east of Montreal where they have access to imports of petroleum directly by tanker and indirectly, by way of the overland pipeline from Portland, Maine.

In conformity with the National Oil Policy, refineries east of the Ottawa Valley may use the cheaper foreign crudes which are entered free of duty, whereas the Ontario refineries must use the somewhat dearer domestic crudes.

Of the Ontario refineries, three are situated in Sarnia and four between Hamilton and Toronto.

A considerable expansion of refinery capacity is planned for the near future, especially east of the Ottawa Valley. In the Montreal area, which would be the area most directly affected by the proposed change in duties, this expansion would amount to some 25 per cent of existing capacity.

In spite of the rapid growth in the domestic disappearance of petrochemical feedstocks, these products represent only a small proportion of the refinery capacity in Ontario and Quebec. In 1968 in Ontario, the domestic disappearance of petrochemical feedstocks represented 17,500 barrels per day or 5.0 per cent of the province's refinery capacity; in Quebec, it amounted to 12,300 barrels per day, or 3.1 per cent of the refinery capacity in that province. However, between individual refineries, the proportion differs. Many refineries sell little or no chemical feedstocks; at the other extreme, petrochemical feedstocks were said to be 10 or 12 per cent of output at Imperial Oil's refinery near Sarnia.

In the past, the domestic production of petrochemical feedstocks, in the aggregate, appears to have been adequate and the expected increases in refinery capacity in the Montreal area make it appear that there is little likelihood of a physical shortage in the near future. It is less clear that prospective developments might not be favourable to an increase in the price of domestic naphtha, even in relation to prices in other countries, if rates of duty permit it.

Even if petrochemical feedstocks could be imported into Canada free of duty there would apparently be no clear financial inducement to import naphtha into the Sarnia area or even the Toronto area. Consequently, the proposal is of direct significance principally within and east of the Ottawa Valley.

It is into this area, also, that crude oil may be imported without conflict with the National Oil Policy. However, it may be noted that the higher price of crude west of the Ottawa Valley is, in part at least, offset by certain special advantages of the Sarnia location, including the possibility of exporting certain products to the U.S.A. without quota restrictions. In any event, it appears that

the prices charged at arm's length for ethylene are comparable in the two areas, as indeed, they must be if the users of ethylene and its products in the two areas are to continue to compete successfully against each other. The Board understands that these chemical and plastics derivatives can be shipped from one area to the other without contravening the National Oil Policy.

The petroleum refiners argued that they should not be compelled to compete on a duty-free basis with foreign producers of naphtha for use as petrochemical feedstocks and that when protection was given to the product of an industry, others should not be enabled to import the partly finished product free of duty.

More broadly, even those that were not actively concerned with the sale of petrochemical feedstocks contended that the co-products of ethylene could compete with their traditional products.

However, it would seem to the Board that, as petrochemical production develops further in Canada, the co-products of ethylene will come to be used almost wholly as feedstock or process fuel in the further production of chemicals, when a relatively light fraction, like naphtha, is the feedstock. When a petroleum fraction like heavy gas oil is used as the feedstock, about 9 to 12 per cent of the original weight of input material would be surplus to the process. This residual portion, which is not consumed either as feedstock or as fuel for the chemical processes, would continue to enter the refineries' fuel markets.

The petrochemical companies that supported the proposed end-use item are non-integrated, in the sense that they purchase their petrochemical feedstocks from refineries, whereas some of the companies that opposed it produce from crude oil the petrochemical feedstocks they use.

It is generally agreed that, in terms of market strategy, the integrated producer possesses advantages. There seems to be no similar unanimity with respect to the relative efficiency of the non-integrated plant; in this respect, conflicting opinions were expressed at the hearing and appear in the literature of the subject. It is contended that when a refinery and petrochemical plant are planned and built as an integrated complex with the same ownership and management, considerable flexibility may be secured in the selection of crudes as well as in the choice of the feedstocks which are transferred to chemical operations and that equal flexibility may be impossible to secure when the petrochemical feedstock is a product precisely specified under contract. On the other hand, such flexibility requires the installation of more complicated and expensive equipment in the petrochemical plant in order to be able to use a variety of feedstocks. Whatever the balance may be in terms of efficiency, the duty on petrochemical feedstocks tends to increase the relative importance of market strategy as compared with efficiency.

Since Union Carbide and Chemcell are both non-integrated chemical producers and since, prospectively, the supply of petrochemical naphtha available from Canadian sources appears to be adequate, it may be supposed that they are urging the free entry of petrochemical feedstocks in order to improve their bargaining positions;

in order, that is to say, to ensure that the price of naphtha charged by the Canadian suppliers would not prevent them from competing successfully against ethylene derivatives whether produced abroad or by integrated petrochemical companies in Canada.

Viewed superficially, then, this Reference arises merely from a difference in the interest, with respect to the price of naphtha, as between the chemical producers and the refineries. It involves primarily the division of a given amount of protection between the non-integrated producers of petrochemicals and certain petroleum refineries. The situation is complicated by the fact that, in terms of industries or companies, there is not a clear division between the producers of petrochemicals and the refiners of petroleum: some refineries convert the petrochemical feedstocks they produce into petrochemicals as well as into products used to produce heat or energy; and some of the co-products of petrochemical plants, in the present circumstances of the industry in Canada, can be used most economically as fuels or as gasoline components. Part of the dispute involves the fact that refiners east of the Ottawa Valley can import their crude oil free of duty while a duty is imposed on petrochemical feedstocks; this situation is further complicated by the fact that refineries west of the National Oil Policy line must use Canadian crude which is higher in price.

Whatever the complexities of the borderline between refinery products and petrochemicals, the Board is not directed to consider changes in the existing free entry of crude petroleum nor in the rates of duty applicable to the various chemicals derived from petrochemical feedstocks. The issue is primarily as to the division of the protective margin between the petrochemical feedstocks, particularly naphtha, and the petrochemicals produced therefrom. However, this division of the margin will tend, in some degree at least, to affect the costs or revenues and, in consequence, perhaps the structure of the refinery and the organic chemical industries in Canada.

In this Reference, there are, of course, considerations which favour the maintenance of the existing rates of duty on petrochemical feedstocks and considerations which favour their reduction or removal.

In the first place, end-use items complicate the Customs Tariff and increase the difficulty of determining the amount of protection actually enjoyed by the industries which are affected by them; they are seldom granted on materials readily available from Canadian production except for use in products which themselves enter free of duty or at low rates, or are important export products when the administration of export drawback is impracticable. In the present case, it appears that petrochemical feedstocks are and will be physically available from Canadian producers in the quantities required; it also seems improbable that petrochemical feedstocks would, in fact, be imported even if admitted free of duty. The relationship of the rate of duty on naphtha to the rates on the derivatives and co-products of ethylene is discussed below.

The proposed end-use item is urged by non-integrated chemical companies; this is understandable because an integrated petrochemical and refinery complex, under the same management and control, has

certain advantages over a non-integrated chemical plant. However, while the advantages of integration are clear in terms of market strategy, the advantages, in terms of over-all efficiency, are disputed -- much more so, in terms of the efficiency of petrochemical production considered by itself.

Union Carbide is considering the erection of a new ethylene plant, probably in the Montreal area, designed to produce 500 million pounds per year or more from naphtha and, possibly, gas oils. The company stated that its decision might depend, in part, on a provision for the free entry of naphtha. Recently, Imperial Oil has expanded its annual ethylene capacity in Sarnia to 500 million pounds and Shawinigan Chemicals has built a plant of somewhat similar size in the Montreal area. These two plants represent a very large increase in Canadian ethylene capacity; since the hearing there has been a press report of the possibility of still another plant. On the other hand, tentative announcements suggest that a very substantial expansion may be imminent of plants which use ethylene as a material. Many of the newer ethylene plants in other countries are designed to produce 1,000 million pounds a year or even more. The construction of another plant of 500 million pounds capacity should not be encouraged merely to secure a competitive market advantage, especially if a still larger plant might be justifiable a little later.

The refineries in eastern Canada suggested that they were not receiving a return on their investment comparable to that received in other countries; in the case of internationally integrated oil companies, this contention is difficult to investigate or confirm. In any event, the revenue from petrochemical feedstocks is not large in relation to the total revenues from a refinery and it would appear that some lowering of the price of naphtha would not inflict serious injury. Also, since the amounts involved are relatively small, the disposal of residual products in the fuels market would not occasion a sufficient disturbance to affect seriously either the fuels market or the National Oil Policy with respect to it.

In the Board's opinion, certain other general considerations are even more important.

Being a small industrial country, Canada has favoured and supported reductions in protective customs duties and other hindrances to international trade, in Canada and throughout the world. In pursuing these objectives, Canada advocated and has continued to support the General Agreement on Tariffs and Trade and has played her part in the various rounds of bargaining that have occurred under its auspices.

In its report on Chemicals, Reference No. 120, Vol. 4, Part II, page 85, the Board remarked:

"Most of the chemicals within the scope of the Reference are used as materials in Canadian production. In many parts of the Canadian Tariff, and in the Tariffs of most other countries as well, lower rates are levied on materials used by productive enterprises than on the finished consumer goods which they are used to produce ... The use of chemicals in Canada is expanding rapidly and the Board is reluctant to recommend incorporation into the

structure of Canadian costs [of] a large and expanding area in which the costs of important materials might be higher ... than those of producers abroad that use the same kind of materials."

It should also be noted that large differences in the effective protection accorded different industries as well as anomalies in tariff rates will give rise to increasingly serious problems of adjustment as these trends and policies are continued.

In applying these considerations to the chemical schedule, the Board recommended certain reductions in the rates on chemicals and certain increases in the rates on plastics. These are reflected in the current Tariff.

From a study of "Effective Protection in the Canadian Economy", prepared for the Economic Council of Canada, it would appear that the effective protection afforded to the industrial chemical industry is comparatively low, as is appropriate for such important industrial materials, while that afforded to the petroleum refining industry is considerably greater. The Board's studies have confirmed the general conclusion that the rates of effective protection accorded to the chemicals most directly involved in this report are relatively low and considerably lower than the rate on refinery products including naphtha.

When related to liquid petrochemical feedstocks, especially naphtha, even the nominal rates set forth in the Customs Tariff show the existence of anomalies which would tend to produce such differences in effective protection. The ad valorem equivalent of the rates of item 26901-1 when applied to naphtha is estimated to exceed 13 p.c.

Ethylene, one of the most important chemicals produced from naphtha, is admitted into Canada free of duty; however, the cost and hazards of transporting it over considerable distances make it improbable that it will be imported into Canada in substantial quantities. For the purposes of international trade, then, it is necessary to compare the rate of duty of naphtha with the rates on the transportable products into which ethylene is converted in Canada. Of these, the largest in volume and value of production is polyethylene, at present dutiable at $7\frac{1}{2}$ p.c. but recommended for 10 p.c. in the Board's Report on Polyethylene - Reference No. 143. Other important derivatives of ethylene include ethylene glycol and polyvinyl chloride, both dutiable at 10 p.c., and ethylene oxide dutiable at 10 p.c., B.P., and 15 p.c., M.F.N.

Naphtha is also used as a feedstock in the production of several other important primary petrochemicals, some of them co-products or by-products of ethylene: propylene is at present admitted free of duty under a temporary item; benzene, butylenes, toluene and xylenes are admitted free of duty when in the form of separate chemicals.

Methanol (methyl alcohol), dutiable for general use at 5 p.c., B.P. and 10 p.c., M.F.N. and free of duty for use in the manufacture of artificial rubber, is produced from naphtha feedstock by a process different from that used for ethylene.

It will be observed that methyl alcohol and most of the important transportable products and co-products of ethylene are admitted either free of duty or at rates lower than the ad valorem equivalent of the specific duty on naphtha. This circumstance arises, presumably, from the fact that tariff items 26901-1 and 26902-1, having been excluded from Reference 120, were not studied at that time and indeed, at the time of the Reference, by-product refinery gases were the principal petroleum products used by non-integrated petrochemical producers. However, since that time, the production of refinery gases has not kept pace with the requirements for petrochemical feedstocks, and their availability in the future may be even more restricted because of the adoption of newer technologies by petroleum refiners. In consequence, expansion of petrochemical production in the future will increasingly require naphtha as a feedstock. Since the cost of naphtha is now an important part of the total cost of the petrochemicals made from it, it seems unreasonable to retain a rate of duty on naphtha for petrochemical manufacture so much higher than is accorded to many of the petrochemicals themselves.

Accordingly, in spite of the disadvantages mentioned earlier, the Board recommends a rate of 1/3 cent per gallon, under both the British Preferential and Most-Favoured-Nation Tariffs, on fractions of petroleum for use as feedstocks in the manufacture of petrochemicals described in tariff headings 92901 or 92904; this is the rate now applicable to the heavier petroleum fractions of item 26902-1. This lower rate would establish for naphtha, when for use as a petrochemical feedstock, a rate which, in terms of ad valorem equivalents, is not greatly different from that on many of the other important petroleum fractions described in items 26901-1 and 26902-1 (appendix table 10) and one which would still afford substantial effective protection to the refineries. The recommendation would not affect the rate of duty on the petroleum fractions of tariff item 26902-1 which include all or nearly all the gas oils, the feedstocks from which substantial quantities of ethylene co-products might be derived for sale in the fuel markets.

Even this rate of duty, of course, is somewhat higher than the rates on several important petrochemicals but it is somewhat lower than the rates on the petrochemicals which appear to be of principal importance to the non-integrated chemical producers. It seems improbable that this lower rate on petrochemical naphtha would occasion any substantial importation into Canada but it would set an upper limit to the price that can be established by the refineries east of the Ottawa Valley and, if lower costs of naphtha should be reflected in lower prices to users of petrochemicals and their products, it might even exercise some indirect influence on prices in the Sarnia petrochemical complex.

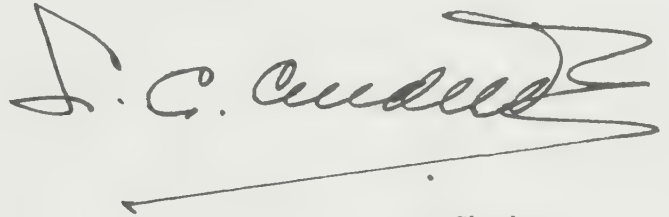
It is quite possible, of course, that the reduction of the duty on naphtha, or even its complete abolition, would be insufficient to induce a non-integrated producer to build a second large ethylene plant east of the Ottawa Valley but, by making such an event less improbable, it may serve to exercise some control on the price of ethylene now commercially available from only one producer in that area.

RECOMMENDED SCHEDULE

That Schedule "A" to the Customs Tariff be amended by inserting therein the following enumeration of goods and rates of duty:

<u>Goods Subject to Duty and Free Goods</u>	<u>British Prefer- ential Tariff</u>	<u>Most- Favoured- Nation Tariff</u>	<u>General Tariff</u>
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Fractions of petroleum described in tariff item 26901-1, for use as feedstocks in the manufacture of the goods described in tariff headings 92901 or 92904	per gallon	1/3 ct.	1/3 ct.	1 ct.
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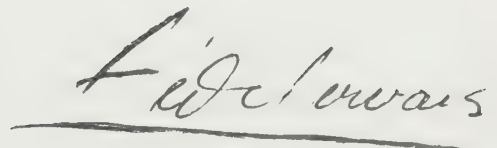
Chairman



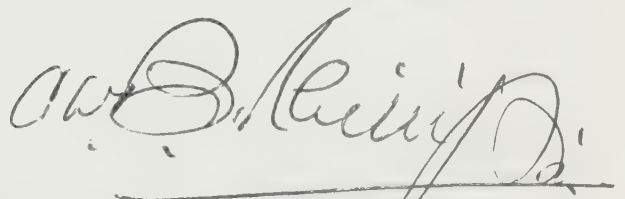
First Vice-Chairman



Member



Member



Member

Ottawa, September 5, 1969

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Table 1

Canada: Shipments of Goods of Own Manufacture by Petroleum Refineries, 1960-67

	1960	1961	1962	1963	1964	1965	1966	1967
				thousand barrels -				
Aviation gasoline	1,280	1,198	1,559	1,631	1,645	1,535	1,579	1,608
Motor gasoline	101,382	104,989	112,139	116,518	122,254	128,795	136,077	141,266
Naphtha specialties	1,482	1,036	663	692	730	776	794	732
Aviation turbine fuel	4,879	6,378	6,788	7,479	7,130	6,734	7,970	8,799
Kerosene, stove oil No. 1	14,611	17,140	17,672	18,716	18,771	18,681	19,021	18,515
Diesel fuel	28,193	28,707	30,488	32,531	35,720	39,470	42,826	45,629
Light fuel oils (Nos. 2 & 3)	48,621	52,197	53,618	59,000	58,745	58,657	60,996	62,062
Heavy fuel oils (Nos. 4, 5, 6)	38,043	41,320	43,974	46,076	48,160	48,093	51,889	54,329
Lubricating oils & greases	1,755	2,373	2,654	2,815	3,148	3,274	3,250	3,239
Asphalt	9,558	9,258	9,366	9,964	10,813	11,161	12,339	12,584
Petroleum coke	178(a)	964	970	958	993	1,156	1,096	1,094
Alkylate & alkylate feedstocks	..	..	..	..	659	777	469	845
Petrochemical feedstocks	3,619	5,114	6,122	6,662	8,867	8,298	9,478	10,255
Liquefied petroleum gases	4,075	4,247	4,738	4,409	4,788	5,018	5,915	6,384
All other products	..	..	..	..	..	..	..	..
			-	thousand dollars -				
Aviation gasoline	10,651	9,431	11,069	10,928	10,439	9,638	10,029	10,203
Motor gasoline	520,956	542,749	574,046	586,682	603,807	618,791	647,782	676,095
Naphtha specialties	8,075	6,695	3,758	4,028	3,591	3,648	3,652	3,565
Aviation turbine fuel	18,811	23,198	24,463	27,210	27,932	26,300	30,631	33,913
Kerosene, stove oil No. 1	64,214	76,770	80,923	84,335	83,790	79,957	79,760	77,801
Diesel fuel	112,913	113,972	123,406	131,766	144,341	154,191	166,652	177,596
Light fuel oils (Nos. 2 & 3)	197,692	209,198	217,933	238,535	239,677	225,398	228,774	232,573
Heavy fuel oils (Nos. 4, 5, 6)	87,305	91,392	96,123	101,385	107,525	109,624	119,040	127,359
Lubricating oils & greases	21,439	33,111	40,150	43,420	47,693	47,609	45,941	44,226
Asphalt	30,484	27,742	27,026	29,661	32,573	33,023	35,585	36,341
Petroleum coke	1,660	1,906	1,871	1,812	1,978	2,410	2,236	1,772
Alkylate & alkylate feedstocks	..	..	..	..	3,168	3,299	3,243	5,311
Petrochemical feedstocks	11,338	16,147	17,427	19,346	28,026	26,395	29,778	32,875
Liquefied petroleum gases	11,385	12,078	12,929	11,692	12,679	12,130	13,888	16,076
All other products	10,934	21,490	25,774	32,136	28,805	32,039	30,444	33,458

(Cont'd)

Table 1
(Cont'd)

Canada: Shipments of Goods of Own Manufacture by Petroleum Refineries, 1960-67

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
			- dollars per barrel -					
Aviation gasoline	8.32	7.87	7.10	6.70	6.35	6.28	6.35	6.35
Motor gasoline	5.14	5.17	5.12	5.04	4.94	4.80	4.76	4.79
Naphtha specialties	5.45	6.46	5.67	5.82	4.92	4.70	4.60	4.87
Aviation turbine fuel	3.86	3.64	3.60	3.64	3.92	3.91	3.84	3.85
Kerosene, stove oil No. 1	4.39	4.48	4.58	4.51	4.46	4.28	4.19	4.20
Diesel fuel	4.00	3.97	4.05	4.05	4.04	3.91	3.89	3.89
Light fuel oils (Nos. 2 & 3)	4.07	4.01	4.06	4.04	4.08	3.84	3.75	3.75
Heavy fuel oils (Nos. 4,5,6)	2.29	2.21	2.19	2.20	2.23	2.28	2.29	2.34
Lubricating oils & greases	12.22	13.95	15.13	15.42	15.15	14.54	14.14	13.65
Asphalt	3.19	3.00	2.89	2.98	3.01	2.96	2.88	2.89
Petroleum coke	9.33(b)	1.98	1.93	1.89	1.99	2.08	2.04	1.62
Alkylate & alkylate feedstocks	..	..	..	..	4.81	4.25	6.91	6.29
Petrochemical feedstocks	3.13	3.16	2.85	2.90	3.16	3.18	3.14	3.21
Liquefied petroleum gases	2.79	2.84	2.73	2.65	2.65	2.42	2.35	2.52
All other products	..	..	..	..	..	..	..	..

(a) Thousand tons

(b) Dollars per ton

Source: DBS, Cat. No. 45-205

Domestic Disappearance of Petroleum Products, by Region, 1968^(p)

	Atlantic Provinces	Domestic Disappearance			B.C. & N.W.T.	Canada
		Quebec	Ontario - thousand barrels	Prairie Provinces		
Propane & propane mixes	408	1,639	1,013	236	448	3,745
Butane & butane mixes	239	40	70	284	72	705
Petrochemical feedstocks	86	4,479	6,397	10	234	11,205
Naphtha specialties	50	534	1,353	130	196	2,263
Aviation gasoline	331	190	255	474	526	1,776
Motor gasoline	11,967	38,125	56,242	33,073	15,203	154,611
Aviation turbo fuel	1,459	4,405	3,570	2,658	1,319	13,411
Kerosene, stove oil, tractor fuel	4,639	6,386	3,462	3,121	2,081	19,689
Diesel fuel oil	6,295	7,806	9,625	12,575	7,528	43,829
Light fuel oil (Nos. 2 & 3)	11,448	33,463	38,003	4,189	5,077	92,180
Heavy fuel oil (Nos. 4, 5, 6)	18,795	49,120	30,869	3,318	10,034	112,136
Asphalt	1,435	3,227	3,829	3,033	1,194	12,717
Coke	(a)	2,602	546	414	(b)	3,562
Lube oils & greases	346	982	1,924	975	525	4,752
Still gas	1,359	2,964	4,065	3,337	2,086	13,812
Other products	3	9	361	440	20	833
Total	58,861	155,972	161,583	68,267	46,544	491,226

(Cont'd)

Table 2
(Cont'd)Domestic Disappearance of Petroleum Products, by Region, 1968^(p)

	Domestic Disappearance				Canada
	Atlantic Provinces	Quebec	Ontario - per cent of total	Prairie Provinces -	B.C. & N.W.T.
Propane & propane mixes	.82	.96	.72	.39	1.01
Butane & butane mixes	.39	.03	.14	.35	.11
Petrochemical feedstocks	.18	3.24	4.27	.13	.60
Naphtha specialties	.09	.37	.87	.20	.39
Aviation gasoline	.78	.15	.17	.70	1.22
Motor gasoline	21.01	24.67	34.53	47.31	31.65
Aviation turbo fuel	2.37	2.76	2.14	3.76	2.52
Kerosene, stove oil, tractor fuel	8.49	4.51	2.35	4.53	3.99
Diesel fuel oil	10.97	5.55	5.61	18.50	15.88
Light fuel oil (No. 2 & 3)	19.14	20.76	23.20	6.90	11.22
Heavy fuel oil (Nos. 4, 5, 6)	29.78	30.93	19.53	5.77	23.75
Asphalt	2.59	2.25	2.33	4.27	2.36
Coke	-	1.36	.54	.63	*
Lube oils & greases	.61	.69	1.21	1.46	1.11
Still gas	2.77	1.76	2.24	4.88	4.02
Other products	.01	.01	.15	.22	.17
Total	100.0	100.0	100.0	100.0	100.0

(a) Included with Quebec
 (b) Included with Prairie Provinces
 (p) Preliminary

Source: DBS, Cat. No. 45-204

Table 3

Supply and Disposition of Petrochemical Feedstocks
in Quebec, Ontario and Canada, 1956-68

		<u>Prod-</u> <u>uction</u>	<u>Imports</u>	<u>Inter-Prod.</u> <u>Transfers</u> - thousand	<u>Exports</u> barrels -	<u>Dom.</u> <u>Disapp.</u>	<u>Net Sales</u> <u>in Canada</u>
<u>Quebec</u>	1956	331(a)	-	-	-	323	323
	1957	487(a)	-	-	-	486	486
	1958	860(a)	1	*	-	867	867
	1959	850(a)	1	- 1	-	851	851
	1960	1,109(a)	*	- 1	-	1,091	1,091
	1961	1,358(a)	-	- 1	-	1,329	1,329
	1962	1,631(a)	17	- 9	-	1,612	1,612
	1963	1,837(a)	4	600	-	2,033	2,031
	1964	3,254(a)	2	425	26	3,211	3,211
	1965	3,334(a)	1	475	6	3,305	3,298
	1966	3,400(a)	21	782	39	4,124	4,125
	1967	3,874(a)	334	677	60	4,660	4,658
	1968	4,191(a)	-	444	61	4,479	4,462
<u>Ontario</u>	1956	1,574	-	- 339	-	1,236	1,227
	1957	2,311	-	- 580	-	1,731	1,733
	1958	3,565	266	- 687	-	3,142	3,052
	1959	3,285	264	- 131	-	2,955	2,901
	1960	3,992	278	-	-	3,559	3,491
	1961	4,373	344	- 471	294	3,991	3,930
	1962	3,991	790	- 36	394	4,410	4,345
	1963	1,102	607	3,230	58	5,224	5,133
	1964	1,585	384	3,733	-	6,118	5,960
	1965	2,641	356	2,250	-	5,713	5,615
	1966	2,911	413	2,664	-	6,013	5,930
	1967	3,249	546	2,778	-	6,565	6,469
	1968	2,539	455	3,433	-	6,397	6,353
<u>Canada</u>	1956	2,171	-	- 339	-	2,138	2,130
	1957	3,195	-	- 580	-	2,991	2,993
	1958	4,802	267	- 687	-	4,840	4,749
	1959	4,475	265	- 132	40	4,799	4,745
	1960	5,497	278	- 1	41	5,719	5,651
	1961	6,095	344	- 472	294	6,008	5,947
	1962	6,198	896	- 81	486	7,064	7,000
	1963	2,959	701	4,808	75	8,359	8,265
	1964	4,839	491	5,203	26	10,495	10,338
	1965	5,975	501	4,131	6	10,595	10,490
	1966	6,361	581	3,526	39	10,449	10,367
	1967	7,233	880	3,698	60	11,676	11,578
	1968	6,981	455	3,898	61	11,205	11,145

(a) Includes Maritimes

Source: DBS, Cat. No. 45-204

Table 4

Domestic Disappearance of Petrochemical Feedstocks,
Quebec, Ontario and Canada, 1955-68

<u>Year</u>	<u>Quebec</u>	<u>Ontario</u> - 000' bbl. -	<u>Other</u>	<u>Canada</u>
1955	315	1,378	345	2,039
1956	323	1,236	579	2,138
1957	486	1,731	774	2,991
1958	867	3,142	831	4,840
1959	851	2,955	993	4,799
1960	1,091	3,559	1,069	5,719
1961	1,329	3,991	688	6,008
1962	1,612	4,410	1,042	7,064
1963	2,033	5,224	1,102	8,359
1964	3,211	6,118	1,166	10,495
1965	3,305	5,713	1,577	10,595
1966	4,124	6,013	312	10,449
1967	4,660	6,565	451	11,676
1968	4,479	6,397	329	11,205

Source: DBS, Cat. No. 45-204

Table 5

Exports of Petroleum Products, 1968

	B.C.	Ontario - barrels -	Quebec	Canada	B.C. - per cent of exports -	Ontario - per cent of exports -	Quebec	Canada
Butane and mixes	175,421	-	-	175,421	7.3	-	-	3.8
Petrochemical feedstocks	-	-	61,270	61,270	-	-	17.7	1.3
Naphtha specialties	-	422,264	-	422,264	-	23.1	-	9.1
Motor gasoline	757,154	146,153	-	903,307	31.6	8.0	-	19.5
Kerosene, stove oil and tractor fuel	39,024	78,555	-	117,579	1.6	4.3	-	2.5
Diesel fuel oil	669,242	28,140	89,148	786,530	27.9	1.5	25.7	16.9
Light fuel oil	300,233	741,149	21,836	1,063,218	12.5	40.5	6.3	22.9
Heavy fuel oil	-	166,406	168,654	384,636	-	9.1	48.6	8.3
Asphalt	-	178,531	-	190,952	-	9.8	-	4.1
Other (a)	455,834	67,845	5,860	535,190	19.0	3.7	1.7	11.5
Total Exports	2,396,908	1,829,043	346,768	4,640,367	100.0	100.0	100.0	100.0

(a) Includes propane and propane mixes, aviation turbo fuel, coke, lubricating oil and grease, still gas and other

Source: DBS, Cat. No. 45-004

Imports of Petroleum Products by Province, 1967

	Atlantic Provinces	Que.	Ont.	Man.	Sask.	Alta.	B.C.	N.W.T. & Yukon	Canada
					- barrels -				
Propane & propane mixes	-	4,348	-	-	-	132	-	-	4,480
Butane & butane mixes	-	-	226,935	-	-	-	-	-	226,935
Petro-chemical feedstocks	-	333,900	545,784	-	-	-	-	-	879,684
Naphtha specialties	-	17,851	157,123	2,993	-	1,157	12,963	65	192,152
Aviation gasoline	322,546	22,135	19,847	55	-	27	-	8,009	372,619
Motor gasoline	845,303	2,820,314	549,801	5,454	-	8,560	2,700	-	4,232,132
Aviation turbo fuel	957,763	2,546,091	29,635	-	-	-	-	-	3,533,489
Kerosene, stove oil & tractor fuel	822,251	1,499,707	290,416	70	-	12,641	508	-	2,625,593
Diesel fuel oil	2,709,315	3,211,331	393,024	127,859	-	5,180	1,411	-	6,448,120
Light fuel oil (Nos. 2 & 3)	3,888,058	3,968,020	1,618,844	-	-	-	258,071	-	9,732,993
Heavy fuel oil (Nos. 4, 5 & 6)	6,729,569	19,370,598	3,552,111	-	-	-	5,589,298	3,067	35,244,643
Asphalt	202,520	34,982	44,923	-	2,587	-	255	-	285,267
Coke	-	1,679,965	382,479	-	-	-	-	-	2,062,444
Lubricating oil & grease	52,736	334,437	1,029,128	53,093	39,528	12,420	216,167	123	1,737,632
Still gas	-	-	-	-	-	-	-	-	-
Other products	1,379	357,288	239,008	-	-	1,243	27,497	-	626,415
	16,531,440	36,200,967	9,079,058	189,524	42,115	41,360	6,108,870	11,264	68,204,598

Source: DBS, Cat. No. 45-204, table 3

Imports of Petroleum Products by Province, 1968 (p)

	Atlantic Provinces	Que.	Ont.	Man.	Sask.	Alta.	B.C.	N.W.T. & Yukon	Canada
					- barrels -				
Propane & propane mixes	49,189	11,410	-	-	-	-	-	-	60,599
Butane & butane mixes	-	-	380,826	-	-	-	-	-	380,826
Petro-chemical feedstocks	-	-	455,149	-	-	-	-	-	455,149
Naphtha specialties	-	14,991	135,915	1,927	-	1,255	12,512	62	166,662
Aviation gasoline	44,861	45,915	-	- 55	-	-	26	10,238	100,985
Motor gasoline	863,386	3,594,243	29,463	5,049	-	7,956	-	-	4,500,097
Aviation turbo fuel	1,434,007	2,705,239	410,336	-	-	-	-	-	4,549,582
Kerosene, stove oil & tractor fuel	1,638,039	1,737,073	309,566	-	-	3,556	336	15	3,688,585
Diesel fuel oil	3,584,470	3,322,255	507,677	260,208	-	4,458	-	85,908	7,764,976
Light fuel oil (Nos. 2 & 3)									
Heavy fuel oil	4,756,559	5,354,139	2,552,923	85,497	-	-	404,504	-	13,153,622
(Nos. 4, 5 & 6)									
Asphalt	8,676,873	18,898,294	1,672,780	-	-	-	4,934,407	2,613	34,184,967
Coke	88,585	2,487	56,633	-	2,675	-	198	-	150,578
Lubricating oil									
& grease	56,756	371,722	1,021,122	65,236	43,221	16,003	246,970	670	1,821,700
Still gas	-	-	-	-	-	-	-	-	-
Other products	-	174,677	66,509	-	-	1,240	38,990	-	281,416
	21,192,725	38,248,684	8,039,351	417,862	45,896	34,468	5,637,943	99,506	73,716,435

(p) Preliminary

Source: DBS, Cat. No. 45-204

Table 8

Exports of Crude Petroleum, s.c. 264-10^(a), 1958-68

Year	Total Exports		Unit
	Quantity	Value	Value
	bbl.	\$	\$/bbl.
<u>1. Total</u>			
1958	31,679,429	73,043,757	2.31
1959	33,362,234	74,541,292	2.23
1960	42,234,937	94,450,014	2.24
1961	64,146,897	152,333,983	2.37
1962	91,580,232	232,496,608	2.54
1963	90,875,816	233,867,132	2.57
1964	101,258,926	262,022,845	2.59
1965	108,010,297	279,956,132	2.59
1966	123,691,342	321,681,008	2.60
1967	150,344,567	397,875,000	2.65
1968	167,487,968	446,413,000	2.67
<u>2. United States</u>			
1958	31,679,429	73,043,757	2.31
1959	33,362,234	74,541,292	2.23
1960	42,234,937	94,450,014	2.24
1961	64,146,897	152,333,983	2.37
1962	91,580,232	232,496,608	2.54
1963	90,875,816	233,867,132	2.57
1964	101,258,926	262,022,845	2.59
1965	108,010,297	279,956,132	2.59
1966	123,691,342	321,681,008	2.60
1967	150,344,567	397,875,000	2.65
1968	167,487,968	446,413,000	2.67

(a) Prior to 1961 was statistical class 7280

Source: DBS, Trade of Canada

Table 9

Imports of Crude Petroleum, s.c. 264-10 (a), 1958-68

Tariff Items: 26701-1, 26702-1, 26705-1 and 26715-1

Year	Total Imports		Unit
	Quantity	Value	Value
	bbl.	\$'000	\$ per bbl.
<u>1. Total</u>			
1958	104,038,769	273,948	2.63
1959	115,288,643	277,495	2.41
1960	125,559,631	280,071	2.23
1961	133,249,113	291,170	2.19
1962	134,517,707	304,898	2.27
1963	147,720,870	334,761	2.27
1964	143,530,957	320,637	2.23
1965	144,184,281	312,259	2.17
1966	146,076,898	299,001	2.05
1967	170,784,980	355,940	2.08
1968	177,738,586	372,586	2.10
<u>2. Saudi Arabia</u>			
1958	29,719,277	68,017	2.29
1959	32,326,487	70,329	2.18
1960	16,229,897	37,402	2.30
1961	19,065,027	41,393	2.17
1962	17,932,434	40,439	2.26
1963	21,799,015	50,290	2.31
1964	8,002,695	18,547	2.32
1965	19,206,948	42,110	2.19
1966	15,965,021	32,544	2.04
1967	14,755,308	30,851	2.09
1968	18,605,542	35,990	1.93
<u>3. Iran</u>			
1958	133,543	265	1.98
1959	5,887,413	10,936	1.86
1960	15,477,253	29,941	1.93
1961	11,748,425	21,115	1.80
1962	17,494,664	31,189	1.78
1963	23,892,907	42,270	1.77
1964	16,930,092	30,489	1.80
1965	18,193,380	30,644	1.68
1966	21,566,828	34,549	1.60
1967	20,550,451	32,132	1.56
1968	20,742,317	32,183	1.55

(Cont'd)

Table 9
(Cont'd)Imports of Crude Petroleum, s.c. 264-10^(a), 1958-68

<u>Year</u>	<u>Total Imports</u>		<u>Unit</u>
	<u>Quantity</u> bbl.	<u>Value</u> \$'000	<u>Value</u> \$ per bbl.
<u>4. Venezuela</u>			
1958	72,364,578	199,909	2.76
1959	73,229,393	187,584	2.56
1960	72,761,878	175,041	2.41
1961	81,556,260	192,202	2.36
1962	85,206,014	207,647	2.44
1963	90,085,126	220,229	2.44
1964	102,308,495	242,908	2.37
1965	88,994,620	208,363	2.34
1966	71,840,047	166,109	2.31
1967	103,345,461	232,476	2.25
1968	124,274,521	278,740	2.24
<u>5. Other</u> ^(b)			
1958	1,821,371	5,757	3.16
1959	3,845,350	8,645	2.25
1960	21,090,603	37,687	1.79
1961	20,879,401	36,460	1.75
1962	13,884,595	25,623	1.85
1963	11,943,822	21,973	1.84
1964	16,289,675	28,693	1.76
1965	17,789,333	31,141	1.75
1966	36,705,002	65,801	1.79
1967	32,133,760	60,480	1.88
1968	14,116,206	25,672	1.82

^(a) Prior to 1964 was s.c. 7153^(b) Includes United States, Trinidad and Tobago, Iraq, Kuwait, British Middle East, Qatar, Nigeria, Angola, Trucial States, Lebanon, Libya and Algeria

Source: DBS Trade of Canada

Imports of Selected Petroleum Products, by Tariff Item, 1967 and 1968

Product and Tariff Item	Quantity '000 gal.	Value \$'000	Unit Value ¢ per gal.	Dutiable Value \$'000	Duty Collected \$'000	Duty as p.c. of
						Dutiable Value p.c.
1967						
26901-1						
Aviation Gasoline	12,658	2,259	17.8	2,259	127	5.6
Motor Gasoline	145,025	15,048	10.4	15,048	1,290	8.6
Aviation Turbo Fuel	114,838	7,887	6.9	7,887	1,030	13.1
L.P.G.	9,821	1,618	16.5	1,617	180	11.1
Naphtha - Total	23,693	2,945	12.4	2,807	220	7.8
Venezuela	11,984	1,049	8.8	1,049	120	11.4
Puerto Rico	6,708	570	8.5	570	67	11.8
U.S.A.(a)	5,001	1,326	26.5	1,187	33	2.8
26902-1						
Diesel and Tractor Fuel	162,757	11,877	7.3	11,877	544	4.6
Kerosene and Gas Oil	64,596	4,963	7.7	4,959	215	4.3
Fuel Oil No. 1	97,399	8,221	8.4	8,221	397	4.8
Fuel Oil No. 2 & 3	332,169	23,571	7.1	23,571	1,107	4.7
Fuel Oil n.e.s.	1,298,837	63,305	4.9	61,381	4,272	7.0

(Cont'd)

Table 10
(Cont'd)

Imports of Selected Petroleum Products, by Tariff Item, 1967 and 1968

<u>Product and Tariff Item</u>	<u>Quantity</u> '000 gal.	<u>Value</u> \$'000	<u>Unit</u> Value per gal.	<u>Dutiable</u> Value \$'000	<u>Duty</u> Collected \$'000	<u>Duty as p.c. of</u> <u>Dutiable Value</u> p.c.
<u>1968</u>						
<u>26901-1</u>						
Aviation Gasoline	4, 720	949	20.1	949	48	5.1
Motor Gasoline	145, 900	15, 818	10.8	15, 818	1, 382	8.7
Aviation Turbo Fuel	170, 062	13, 168	7.7	13, 168	1, 659	12.7
L.P.G.	14, 380	2, 010	14.0	2, 004	241	12.0
Naphtha - Total	4, 888	1, 393	28.5	1, 264	33	2.6
Venezuela	-	-	-	-	-	-
Puerto Rico	-	-	-	-	-	-
U.S.A.(a)	4, 887	1, 391	28.5	1, 263	32	2.6
<u>26902-1</u>						
Diesel and Tractor Fuel	212, 455	17, 886	8.4	17, 885	709	4.0
Kerosene and Gas Oil	74, 871	6, 611	8.8	6, 607	320	4.8
Fuel Oil No. 1	138, 180	12, 369	9.0	12, 366	500	4.0
Fuel Oil No. 2 & 3	481, 955	37, 925	7.9	37, 923	1, 653	4.4
Fuel Oil n.e.s.	1, 130, 197	54, 539	4.8	52, 685	3, 708	7.0

(a) Mainly highly refined naphtha specialties

Source: Derived from DBS data

APPENDIX II

TARIFF HISTORY

TARIFF HISTORYTariff Item 26901-1, formerly 269(i)

Products of petroleum, n.o.p.:-

26901-1 Lighter than .8236 specific gravity (40.3 A.P.I.)
at 60 degrees Fahrenheit

		<u>B.P.</u>	<u>M.F.N.</u>	<u>General</u>
May 2, 1936	per gallon	$\frac{3}{4}$ ct.	1 ct.	2 cts.

Prior to May 2, 1936, most of the goods in this item were classified under item 271.

271:

Distilled, refined and purified petroleum oils, coal and kerosene, gasoline, engine distillate, naphtha and products of petroleum, n.o.p., lighter than .8235 specific gravity at 60 degrees temperature

September 17, 1930	per gallon	2 cts.	$2\frac{1}{4}$ cts.	$2\frac{1}{2}$ cts.
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Prior to September 17, 1930, this item was worded:

Oils, coal and kerosene, distilled, purified or refined petroleum, and products of petroleum, n.o.p.

November 30, 1906	per gallon	$1\frac{1}{2}$ cts.	$2\frac{1}{4}$ cts.	$2\frac{1}{2}$ cts.
-------------------	------------	---------------------	---------------------	---------------------

Tariff Item 26902-1, formerly 269(ii)

Products of petroleum, n.o.p.:-

26902-1 .8236 specific gravity (40.3 A.P.I.) or heavier at
60 degrees Fahrenheit

May 19, 1948	per gallon	$\frac{1}{3}$ ct.	$\frac{1}{3}$ ct.	1 ct.
May 2, 1936	per gallon	$\frac{1}{3}$ ct.	$\frac{1}{2}$ -ct.	1 ct.

Prior to May 2, 1936, most of the goods in this item were classified under item 267.

267:

Oils, petroleum (not including crude petroleum imported to be refined or illuminating or lubricating oils), .8235 specific gravity or heavier at 60 degrees temperature

February 16, 1916	per gallon	$\frac{1}{3}$ ct.	$\frac{1}{2}$ ct.	$\frac{1}{2}$ ct.
-------------------	------------	-------------------	-------------------	-------------------

Prior to February 16, 1916, this item was worded:

Crude petroleum, fuel and gas oils, .8235 specific gravity or heavier, at 60 degrees temperature

November 30, 1906		Free	Free	Free
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2 A1 FN 55

-69R72

Tariff Board



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Report *by* *of*

THE TARIFF BOARD

in Reference

Relative to the Investigation Ordered
by the Minister of Finance
respecting

**BINDER TWINE AND TWINE FOR
BALING FARM PRODUCE**

Reference No. 142

CAIFN 55
-69R42



Report by

THE TARIFF BOARD

Relative to the Investigation Ordered
by the Minister of Finance
respecting

**BINDER TWINE AND TWINE FOR
BALING FARM PRODUCE**

Reference No. 142

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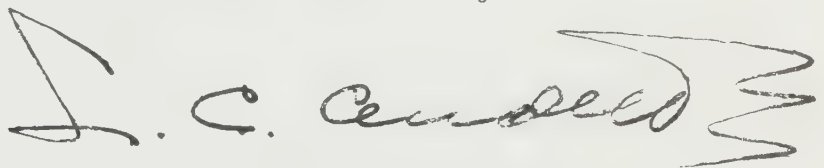
The Honourable
The Minister of Finance
Ottawa

Dear Mr. Minister:

I refer to your letter of July 16, 1968, in which you directed the Tariff Board to make a study of the economics of the binder and baler twine industry in Canada, both from the production and consumption points of view.

In conformity with Section 6 of the Tariff Board Act, I have the honour to transmit this Report of the Board entitled "Binder Twine and Twine for Baling Farm Produce", in English and in French. A copy of the transcript of the proceedings at the public hearings accompanies the Report.

Yours faithfully

A handwritten signature in dark ink, appearing to read "J. C. Campbell", followed by a large, stylized flourish or scribble.

Chairman

SYMBOLS

- Denotes zero or none reported
- .. Indicates that figures are not available
- * In statistical tables, indicates a reported figure which disappears on rounding, or is negligible
- (a) A small letter in brackets denotes a footnote to a table
- (1) A number in brackets denotes a footnote to the text
- s.c. Denotes a Dominion Bureau of Statistics import or export statistical class
- (Vol. -, p. -) Denotes volume and page of the transcript of proceedings at the public hearing unless the context clearly indicates another cited reference

The sum of the figures in a table may differ from the total, owing to rounding

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Ottawa, July 16, 1968

Mr. L.C. Audette
Chairman
The Tariff Board
Ottawa.

Dear Mr. Audette:

I have received representations to the effect that binder twine and twine for baling farm produce are being imported into Canada in such increased quantities and under such conditions as to cause or threaten serious injury to Canadian producers. These twines enter free of duty under tariff item 40922-1.

In considering these representations the Government will wish to have in its possession the most complete information which can be obtained regarding production, consumption, marketing, imports and exports of these products, and regarding the effects on Canadian producers and consumers of the operation of the Canadian tariff relative to binder and baler twine. The Government will also wish to have information on the relative importance of these products as a cost element in the different segments of Canadian agriculture in which they are used.

I, therefore, direct the Tariff Board to make a study, under section 4(2) of the Tariff Board Act of the economics of the binder and baler twine industry in Canada, both from the production and consumption points of view. I would ask the Board to submit a report on its study as soon as possible.

Yours sincerely,

E.J. BENSON

Date of Public Hearing
and
List of Governments, Companies
and Associations which made Representations

A public hearing before the Board was held at Ottawa from October 28 to November 1, 1968. Representations were made to the Board by the following governments, companies and associations:

Ambassade de Belgique	Ottawa, Ontario
The Canadian Federation of Agriculture, and Interprovincial Co-operatives Limited Union Grain Growers United Farmers of Alberta Co-operative	
Caristrap Corporation	Laval, Quebec
Companhia De Fiacao E Cordoaria De Angola, S.A.R.L.	Benguela, Angola
Companhia Industrial De Cordoarias De Mocambique S.A.R.L.	Nacala, Mozambique
Companhia Uniao Fabril S.A.R.L.	Lisbon, Portugal
Cordage Institute of Canada, representing, Brantford Cordage Company Doon Twines Limited International Harvester Co. Canada, Ltd. Plymouth Cordage Company of Canada Ltd.	Montreal, Quebec Brantford, Ontario Kitchener, Ontario Hamilton, Ontario Welland, Ontario
Cordage Manufacturers Export Group of United Kingdom	London, England
Cordemex S.A. de C.V. Mérida	Yucatan, Mexico
CORFI-Organizações Industriais Texteis, Manuel de Oliveira Violas S.A.R.L.	Silvalde-Espinho (Portugal)
Dancord, Danish Cordage Manufacturers	Preuille, Quebec
J. E. Derenne Limited	Montreal, Quebec
Farmers' Union of Alberta	Edmonton, Alberta
Manuel Rodrigues de Lima & Filhos S.A.R.L.	Cortegaca, Portugal
Marshall Wells Limited	Winnipeg, Manitoba
Ministère de l'Agriculture et de la Colonisation	Quebec
Ministry of Commerce and Industries	Dar Es Salaam, Tanzania
National Cordage Company	Toronto, Ontario
National Farmers Union	Ottawa, Ontario
Quintas & Quintas	Povoa de Verzim, Portugal
Royal Netherlands Embassy	Ottawa, Ontario
Saskatchewan Department of Agriculture	Regina, Saskatchewan
Schafer Brothers Ltd.	Montreal, Quebec
SICOR-Sociedade Industrial de Cordoaria, Limitada	Cortegaca, Portugal
S. Norman Sancton & Son Limited	Saint John, New Brunswick
The United Automobile-Aerospace and Agricultural Implement Workers of America	Toronto, Ontario
The United Steelworkers of America	Toronto, Ontario
Wheat-Belt Industries Ltd.	Calgary, Alberta

THE PRODUCTS AND THEIR USE

The products relevant to this inquiry are binder twine and twine for baling farm produce imported, free of duty, under tariff item 40922-1. Twines of sisal, hemp, cotton, jute, paper and those from man-made fibres are admitted under the provision in the item for "twine for baling farm produce". Twines may be entered under this item for any farm baling use; in addition to baling hay and straw, these uses include, for example, the baling of tobacco leaves and Christmas trees. Baler twine for uses other than the baling of hay or of straw, however, were not the subject of representations before the Board.

In this Report the words "harvest balings", or, as appropriate, the word "balings" will be used to refer to all the various types of ties or bindings used for agricultural purposes, with the exception of wire; thus harvest balings will include any cordage, twine, tape and other tying agents whether made from natural fibres or synthetic materials. The words "harvest twine" will be used to refer only to binder twines and baler twines made from natural fibres.

The use of twine for binding sheaves of cereal crops such as wheat, oats, barley and rye has a long history but the use of twine for baling fodder is of relatively recent origin and has become particularly important since the second World War with the increasing use of the automatic hay baler.

With the growing use of the combine harvester-thresher, the use of binder twine has been declining. For example, in 1955, the apparent use of binder twine in Canada was about 22 million pounds whereas by 1967 it was only about 6.5 million pounds. On the other hand, twine for baling has become one of the major products of the cordage industry. Total Canadian consumption of baler twine has increased from less than 19 million pounds in 1955 to approximately 80 million pounds in 1967; over this same period shipments of baler twine from the Canadian producers have increased from about 31 million pounds to about 54 million pounds.

In Canada, the principal types of harvest twines are made from hard natural fibres, mostly sisal or henequen. Some balings made of synthetic fibres, especially polypropylene, are coming into use and some balings made from special paper are used, particularly for the hand-tying of bundles of tobacco leaves. These balings are generally cylindrical in shape, the shape most suitable for the binder and baler machinery now in use. The Board was informed of another product composed of synthetic filament, finished in a tape form, which is used to some extent for these binding or baling purposes. This form of product was said to have found some use in Europe but in Canada it has not yet become a factor of commercial significance in the uses which are under review in this study. One of the factors of particular importance in the use of a baling is its serviceability in the type of machinery with which it is to be used. At the time of harvest, it is essential that the baling perform satisfactorily and that as little time as possible be lost through breakage of the baling in the machine or through its improper passage through the mechanism or its failure to knot satisfactorily when the tying operation is performed. Most harvest machines now in use in North America are designed to accommodate the standard twines made from natural hard fibres. Some

adjustment in the machines is necessary if they are to handle synthetic balings, especially those which are not in the usual cylindrical shape. Considerable discussion took place before the Board on the difficulties that might be encountered by the individual operator if he were to attempt to make this changeover on his own initiative. Moreover, it was stated that alterations to parts of the harvesting machine could invalidate warranties, a risk which a farmer would be reluctant to assume for any slight marginal improvement he might hope to gain from the use of a new form of baling instead of the standard one.

Both binder and baler twines are sold in packages or "bales" in a form ready for use on the harvest machine; they are packaged in cylindrical balls for use in binder and baler machines. The length and weight of twine are important specifications; hard fibre (sisal and henequen) binder twine is usually sold in a 50-pound package, at 600 feet per pound and baler twine in a 40-pound package, at 9,000 feet per package, or 231 feet per pound. Baler twine is also sold in 10,000-foot packages. Synthetic balings are usually lighter than hard fibre twine, by possibly one-third, depending on grade or quality; they are generally sold by length alone; the common length per bale is 8,000 or 9,000 feet.

The weights, measurements and labelling of harvest twines were the subject of considerable discussion at the public hearing. Binder twine is regulated under the Inspection and Sales Act, administered by the Department of Agriculture and baler twine is dealt with under the Weights and Measures Act, administered by the Department of Consumer and Corporate Affairs. Many of the interested parties expressed the desire for more stringent and specific regulations concerning baler twine; the spokesman for the Canadian Federation of Agriculture expressed this viewpoint on behalf of the users of twine and was supported by a spokesman for the Cordage Institute of Canada, on behalf of the twine producers in Canada, as well as by a number of other parties coming before the Board.

In addition to possessing the correct weight, length and uniformity, the harvest twine should also be able to withstand the weather, sun, heat, insects, rodents and other hazards incidental to use.

It was generally agreed in representations to the Board that most imported twines meet the requirements and that quality differences in the twine were not, as a rule, major factors in the competition for the market except in so far as a company's name or brand, over the years, had come to be identified with satisfactory quality, and the company's reputation with respect to guarantees and service had gained for it a preferred position with some users.

Principal Raw Materials, Their Characteristics and Sources of Supply

The principal raw materials used in the production of binder and baler twines in Canada are the natural fibres of sisal and henequen, neither of which is grown in Canada. These fibres are imported free of duty under tariff item 54005-2. Pesticides and preservatives used in the treatment of the twines are entered free of duty under tariff item 44200-1 or subject to a drawback of 99 per cent of duty under drawback item 97001-1.

Sisal is obtained from the leaves of *Agave sisalana*, also known as sisal hemp. The sisal plant is a large rosette of rigid, straight, fleshy leaves arising from a short trunk. Its leaves are dark green in colour and have a terminal spine. Sisal fibre is white to yellowish-white in colour and is strong and flexible. Sisal is mainly grown in countries with a tropical climate, such as East and West Africa and South America. The fibres produced from this material are strong, flexible and durable, well suited and widely used for agricultural twines. On an average, 100 pounds of sisal leaf produces 4 pounds of fibre and tow, of which about 92 per cent is fibre.⁽¹⁾ The life period of this plant is from five to ten years, and two or three years typically are required for the plant to reach the stage of maturity at which its fibre can be used. This life cycle is a matter of considerable importance, as noted later, in determining the availability of supply of fibre over fairly long periods of time.

Although the main outlet for sisal is the manufacture of baler and binder twine, it is also used for ropes, commercial tying twines, cords, floor coverings, padding and upholstery, and, to a lesser extent, in the manufacture of bagging and sacks, the reinforcement of building board and the manufacture of paper.

Henequen (*agave fourcroydes*) is a plant very similar to sisal. It is grown chiefly in Mexico. On the history and characteristic of this fibre it was stated in the submission by "Cordemex", the Mexican producer and exporter of twine, that:

"(a) The plant is indigenous [to] Yucatan, Mexico, and is known in the trade as henequen (*agave fourcroydes*). The sprouts that initiated plantings in other countries of the world originated from Yucatan, and the early shipments of the fibre were made from its port, Sisal. Fibre now produced in countries other than Mexico are known commercially as 'Sisalana' (*agave sisalana*), the names originating from the original port of export, Sisal, Yucatan." (Vol. 3, p. 464)

The consensus of opinion among Canadian twine manufacturers, importers and users was that sisal was the preferred fibre because it possesses greater tensile strength and some advantages in spinning and handling. As a result, sisal fibre and twines were said to be typically priced somewhat higher than those of henequen. Moreover, manufacturers of twine in Canada stated that they recently had encountered difficulty getting henequen fibre from Mexico, a situation which they deemed might be associated with the increased production of twine in that country, much of which was for export to the U.S.A. and Canada. The four producers of harvest twines in Canada reported that their last imports of henequen fibre from Mexico were late in 1966 or early in 1967.

Imports of sisal and henequen into Canada generally have ranged from about 60 to 85 million pounds a year over the past fifteen years. There has been no significant trend upward or downward in that period, although imports of fibres in the 1960's have been, on the average, well above those of the 1950's, reflecting the increase in

(1) Industrial Fibres, The Commonwealth Secretariat, London, 1968, p. 151

baler twine manufacture since 1961 (cf. Appendix (1)). The data for 1968 suggest that imports of fibre in that year were well below the levels of the preceding years, and reflected the lower production of twine in 1968 and, apparently, plans for even lower production in 1969. Statistics of imports of sisal and henequen are not available separately; however, the available information indicates that almost all fibres now imported for harvest twine manufacture are sisal.

As frequently happens with agricultural produce, the prices of these fibres fluctuate greatly from one year to another. This matter is dealt with in more detail in a later section, but the variations in the unit values of imports in table 1 are indicative of the fluctuations and of the relatively low unit values in 1967 and 1968.

Table 1

Imports of Sisal (including henequen), Istle and Tampico
Fibres into Canada, Selected Years, 1950-1968

<u>Year</u>	<u>Quantity</u> ('000 lb.)	<u>Value</u> (\$ '000)	<u>Unit Value</u> (¢/lb.)
1950	56,907	8,236	14.5
1955	65,626	5,824	8.9
1960	59,128	6,099	10.3
1964	85,430	14,783	17.3
1966	85,151	8,155	9.6
1967	69,682	5,612	8.1
1968	51,649	3,887	7.6

Source: D.B.S., Trade of Canada

In 1967, the principal sources of fibre supply, for Canada, were Tanzania, Brazil, Haiti, Kenya, Mozambique, Malagasy Republic, Angola and Mexico; the imports from Mexico are presumably of henequen and in 1967 amounted to 3.7 million pounds compared with an average of nearly 9 million pounds over the ten preceding years; imports of fibre from Mexico in 1968 were less than one million pounds. Spokesmen for the Canadian harvest twine industry noted that henequen fibre of the grades they require for harvest twine have not been available from Mexico over the past year.

Imports of hard fibres over the past twenty years have been recorded from as many as thirty-one countries. The volume of imports from each of these sources of supply has fluctuated considerably through the years reflecting, no doubt, normal fluctuations in crops, the increasing production of fibres in some countries, the decline in others, as well as the increasing domestic production of twine in many fibre-growing countries which has enabled them to export the twine rather than the fibre. Mexico, which supplied a substantial share of Canada's requirements of fibres in the early 1950's has, as noted above, greatly diminished in importance as a source of fibre supply in recent years; Tanzania, Brazil and Haiti had emerged as substantial suppliers by 1967. A significant portion of Canada's requirements of

hard fibres has generally come as re-exports from the U.S.A. Imports of hard fibres for 1967, by principal country of origin, are given in table 2.

Table 2

Imports of Sisal, Istle and Tampico Fibres
into Canada, by Country of Origin, 1967

<u>Country of Origin</u>	<u>Quantity ([']000 lb.)</u>	<u>Value (\$[']000)</u>	<u>Unit Value (¢/lb.)</u>
Tanzania	16,636	1,383	8.3
Brazil	15,613	1,104	7.1
U.S.A.	14,279	1,231	8.6
Haiti	11,349	849	7.5
Kenya	5,623	513	9.1
Mexico	3,656	282	7.7
Malagasy Rep.	1,654	174	10.5
Angola	<u>586</u>	<u>33</u>	<u>5.6</u>
Total, All Countries	69,682	5,612	8.1

Source: D.B.S., Trade of Canada

Other materials used in the manufacture of twines are processing oils and preservatives such as lubricating oils, waxes, insecticides, fungicides, and rodenticides. Some petroleum oils are imported from other countries, especially the United States.

The world supply of sisal and henequen suffers from cycles of over-production, low prices and intense competition, and of scarcities and high prices which give rise to uncertainties in the international market which, in turn, have adverse effects on the economies of the fibre producing countries and on the harvest twine industry. When prices rise, increased plantings are encouraged which will not produce fibre for harvest for two or three years (or longer for henequen in Mexico). Thus, shortages of supply and rising prices may induce heavy plantings over two or three years before a situation of over-supply of fibre becomes evident and heavy pressures develop to dispose of stocks at substantially reduced prices. In Canada, contracts to purchase fibre must be made months before the fibre enters into twine production and the fortunes of a twine producer depend to a considerable extent on his ability to buy fibres most advantageously. As one submission stated:

"The prices of raw material for harvest twines (sisal fibre) form a determinant of the selling price of harvest twines; about 2/3 of the selling price are cost of raw materials. These raw materials are offered in the free world market at continually fluctuating prices. The great importance of an efficient and aggressive purchasing policy of the individual harvest twine manufacturers is obvious." (Vol. 4, p. 722)

The 1964 annual report of Tancord Industries Limited, reporting for the Brantford Cordage Company, notes:

"Our interim report to shareholders in December indicated to you that although our sales and operations were satisfactory, a drastic reduction in sisal prices would necessitate an inventory write-down at the year end. The price of sisal dropped from 18 7/8¢ per pound to 13 3/4¢ per pound and in a market decline of this magnitude, it is virtually impossible in this industry to avoid heavy losses."

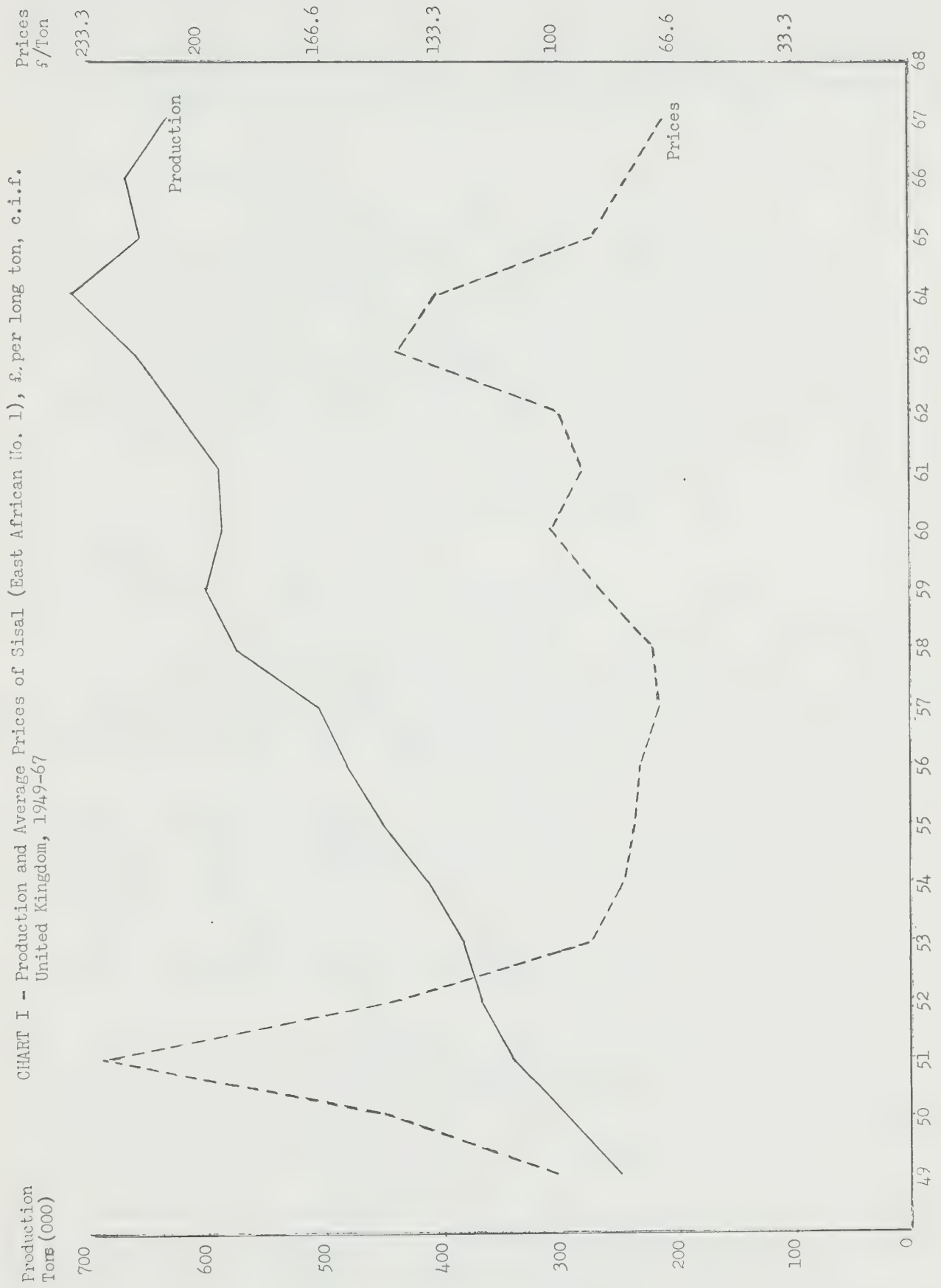
The price of sisal reached its highest point in the past two decades in 1951 during the Korean War. This was followed by expansion in world production but, by 1957, prices were only about one-third what they had been at the peak in 1951. Prices started rising again in 1958, and the production of sisal revived in the 1960's, reaching its peak in 1964 with prices about twice those of 1957. Sharp declines in prices then set in but declines in production, which began to occur in many countries, were not especially great, at least by 1968. The developing countries over this period became more and more committed to processing their sisal into twine, most of which they must try to export. In 1968, the price of sisal reached the all-time low of the last two decades, slightly below the level it had reached in 1957. The details of production and prices of sisal in the world market are given in Chart I. Production and prices of henequen followed a similar pattern to those of sisal.

The latest marketing situation of these fibres is summarized as follows by the United Nations Food and Agriculture Organization (FAO).

"Prices to hard fiber growers throughout the world are presently at about the depressed level of the early thirties, though production costs are estimated to be at least five to six times higher. Prices thus almost everywhere fail to cover costs and estates are closing, many more are showing heavy financial losses, and the peasant smallholders in Angola, Brazil, Haiti and the Philippines are suffering hardship.

"Despite very low prices during most of the year, production was about the same as in the past two years in three of the main sisal producing countries, Tanzania, Brazil and Mozambique, but in three others (Angola, Kenya and Haiti) it probably fell heavily. Henequen output in Mexico continued its slow decline of recent years, on account of a further decrease in production by private landowners, who receive no price support but who still contribute some 30-40 per cent of total output."(1)

(1) FAO Commodity Review, 1968, Food and Agriculture Organization of the United Nations, Rome 1968 (CCP 68/4), p. 156



Source: Industrial Fibres, Commonwealth Secretariat, London.

The FAO Study Group on Hard Fibres and its Consultative Subcommittee studied in detail three main problems: declining export prices, intense export competition and increasing competition from synthetics. In an effort to alleviate the difficulties, the FAO Study Group on Hard Fibres and its Consultative Subcommittee have tried to stabilize prices at levels compatible with the maintenance of adequate economic conditions in the producing countries and acceptable to importing countries, to establish quotas to bring adjustment in production and consumption, and to safeguard the interest of hard fibres against competition from synthetics.

THE CANADIAN HARVEST TWINE INDUSTRY

Harvest twines have been manufactured in Canada for seventy years or so. There are at present four companies manufacturing these twines from sisal and, to a small extent, when available, from henequen. All of these companies are located in southwestern Ontario. The Brantford Cordage Company, (Division of Tancord Industries Limited), Brantford, has been producing harvest twine since 1900; Plymouth Cordage Company of Canada Ltd., Welland, since 1906; International Harvester Company of Canada, Limited, Hamilton, since 1925, and Doon Twines, Limited, Kitchener, since 1950.

Production of synthetic balings in Canada is of recent origin, starting in 1965 and it is still only very small compared to harvest twine production. Poli-Twine Corporation, Saskatoon, and Grace Fibres Canada Ltd., Brantford, are producing baler twine from polypropylene; the production of Grace Fibres is composed in part of an extensible kraft paper. A flat, tape-like product made from viscose and rayon filaments by the Caristrap Corporation, Laval, Quebec, which is used in Canada for a number of tying purposes including the packaging of tobacco leaves, is said to be used, to some extent, for the baling of farm produce in Europe.

Canada Western Cordage Co. Ltd., Vancouver, British Columbia, a subsidiary of Columbian Rope Company, Auburn, New York, for a few years produced harvest twines from sisal imported from Africa but, chiefly because of the severe competition in the market for these twines, the company ceased production of these products in 1962. The company is, however, manufacturing other cordage products for the marine and fishing industries.

At the present time, the four manufacturers of harvest twines from sisal and henequen account for all but a small fraction of Canadian production of the relevant harvest twines. They are also engaged in the production of other products such as ropes and other types of cordage and, in the case of International Harvester, the production of agricultural and other machinery. In general, the production of harvest twines has been a decreasing proportion of each company's operation, though these twines continue to have an important place in the company's manufacturing and distribution activities. At least some of the four companies are also manufacturing synthetic twines on an experimental basis.

Location and Concentration

The four firms manufacturing harvest twines from hard fibres, as noted above, are all located in Southwestern Ontario. The concentration reflects in part the demand for the twines in this area, particularly the demand for baler twine for hay to feed the livestock population in Ontario, Quebec and neighbouring parts of the U.S.A. It reflects also the very good transportation facilities, the adequate supply of electric power and the adequate supply of labour.

The spokesman for the Brantford Cordage Company stated at the public hearing:

"... the area of southwestern Ontario protruding as it does into the northern part of the United States is very fortunately located to serve the large markets both in eastern United States and in the north central States where the greatest amount of harvest twine is consumed -- New York, Pennsylvania, Ohio, Michigan, Indiana, Wisconsin, Minnesota, Iowa are all major twine consuming States and we are happily located to serve them." (Vol. 1, p. 84)

The companies' interests other than harvest twines also favour to a certain extent the location of their plants in the industrial part of Ontario.

Capital Investment and Value of Fixed Assets

No published information is available specifically on the capital investment in the harvest twine industry in Canada. However, from information available to the Board, the total gross investment in production machinery for harvest twines appears to be of the order of \$3 million. Almost all of this investment was made prior to 1955 and some of it prior to World War II. Additions have been made during the 1960's in handling equipment, and in weighing and packaging equipment as a part of plant modernization. The life of the twine manufacturing machinery is stated to be from 25 to 30 years, depending on the maintenance and care.

Some published information is available on investment in synthetic twines, the production of which has begun quite recently in Canada. Poli-Twine Corporation is reported to have an investment of \$800,000 in its plant in Saskatoon, Saskatchewan.⁽¹⁾ Brantford Cordage, Doon Twines, Plymouth Cordage and Grace Chemicals have invested in equipment for the production of synthetic twines, some of which are for agricultural use.

Capacity

The capacity of the twine industry to manufacture harvest twines is claimed to exceed the market for binder twine and to equal the Canadian market for baler twine. This capacity has remained unchanged for the last five years. The current capacity to produce these twines in Canada on a one-shift, two-shift or three-shift basis was given by the Cordage Institute of Canada as follows:

(1) Progressive Plastics, June, 1965, p. 50

	<u>One Shift</u> ('000 lb.)	<u>Two Shift</u> ('000 lb.)	<u>Three Shift</u> ('000 lb.)
Baler Twine	28,696	59,675	87,535
Binder Twine	11,235	23,356	35,407

Source: Transcript, Vol. 1, p. 28

The apparent Canadian market for baler twine in 1967 was just under 80 million pounds and Canadian shipments were 54 million pounds, of which 24 million pounds were exported. Thus, the Canadian manufacturers were supplying from their own production less than one half the market in Canada.

In recent years, therefore, because of the dwindling market in binder twine and the import competition for baler twine, the Canadian industry has not been able to operate at full capacity even with a substantial, though declining, export business. Altogether, in 1967, the companies were operating on close to a two-shift basis for baler twine, but less than one shift for binder twine. In the ten months of 1968 for which data are available, they were operating, in total, on about a one and one-half shift basis for baler twine and less than one-half a shift for binder twine. International Harvester had not been producing harvest twines in Canada since May, 1968. The capacity of the Canada Western Cordage plant, which is not included in the above capacity figures, has not been used since 1962.

When asked whether fewer than the four companies would bring equilibrium in the market, the spokesman for the Cordage Institute of Canada stated:

"With respect to the Canadian market if one or two or three Canadian companies were to go out of business under existing conditions the fourth one would have difficulty in surviving."
(Vol. 1, p. 83)

Process of Manufacture

The machinery used and the process of manufacturing harvest twine is much the same throughout the world. Almost all the producers use the same basic machinery, made by James Mackie & Sons, of Belfast, Ireland, with slight variations in layout and ancillary equipment. The principal machines used are for breaking, combing, spinning, and winding, and the major processes are: preparing the fibre for spinning, spinning the prepared fibre into twine, and winding the twine into balls for shipping and use. The labour employed is mainly unskilled. Entry into the industry is comparatively easy and economies of scale are limited.

Sisal or henequen, after removal from the bale, is fed onto a conveyor by hand and treated with special rot and rodent-repellent emulsions and lubricants. The fibre is then combed and attenuated on the initial preparation machine and is put into a continuous loose rope-like form. Generally the fibre, now called a "sliver", runs

through seven stages of combing, starting out at approximately $1\frac{1}{2}$ ft. per lb. and being extended to 50 ft. per lb. By this time it has been thoroughly cleaned and blended, and all knots have been taken out. The finished sliver runs out of the machine very evenly, about $1\frac{1}{2}$ to 2 inches in diameter.

From the combing machines, the finished sliver goes to the spinning machines where it is again combed and reduced in diameter and extended in length, the size depending upon the type of twine being manufactured. At this point the fibre is given approximately 12 twists per foot and becomes twine. The twine is automatically wound on bobbins from which it is rewound on what is known as a balling machine. From here it goes to packaging and labelling machines and is ready for market.⁽¹⁾

The spinning and winding processes can vary somewhat but, in order to obtain good quality, close mechanical controls must be maintained on twist, smoothness and uniformity of the product.

In the earlier stages of production (combing, treatment of fibre etc.) the process and the machinery used is the same for binder and baler twines but in the spinning operation the machinery is specialized, principally because the twines are different in thickness and in other characteristics.

Among the problems faced by the industry in the process of manufacture of harvest twine, in addition to inventory control already noted, are the length of runs, discontinuity in the use of machinery and equipment, and problems of planning production throughout the year. These problems result from the seasonal nature of the market, the shortness of the summer season and the vagaries of weather that affect hay production.

The manufacture of synthetic balings involves extrusion of synthetic filaments and the twisting of two or more components; the process varies from one company to another depending upon the material used and the finished product. One method developed and used is that in which resin pellets (polypropylene) are fed into an extruder which melts, homogenizes and meters the plastic at high pressure into a die from which it emerges as strands. These strands are immediately cooled and solidified under water and are passed over a series of rolls running at 50-100 f.p.m. The strands then enter a radiant heat oven and pass over a second set of rolls rotating at eight to ten times the speed of the first set. It is between the two sets of rolls that the great strength of the plastic is developed, approximately from 3,000 p.s.i. to 70,000 p.s.i. This process is developed and used by the Poli-Twine Corporation in Saskatoon, in its production of synthetic balings.⁽²⁾

(1) "The Story of Twine in Agriculture", published by International Harvester Company of Canada, Limited, Hamilton, Ontario, p. 17, 18

(2) Saskatchewan, Department of Industry and Commerce, The Growth Province, Saskatchewan, Vol. 10, No. 4, June-July, 1965

Grace Fibres Canada Ltd., under exclusive licence from Cordex Limited, Cyrville, Ontario, manufactures a synthetic baler twine consisting of an inner core of polypropylene monofilament yarns (providing the strength) enfolded in an outer wrapping of extensible kraft paper (providing the bulk). The process is mainly one of extrusion and twisting.⁽¹⁾

Caristrap Corporation, Montreal, developed a process of manufacturing synthetic balings by using substandard tire yarn and cord filaments. The method involves taking yarn of viscose rayon or other synthetic material, and bonding these together by a chemical adhesive process to form a flat, tape-like product. The product is put on spools, cheeses or cones and sold for various tying and binding purposes. Commercial sales of the product have not been made in Canada for machine binding or baling, although it has been used for other agricultural tying operations such as the hand baling of tobacco. One of the benefits claimed for the product is that its tensile strength and size can be precisely controlled.

Costs of Manufacture and of Manufacturers' Distribution

In the manufacture of hard fibre harvest twines in Canada, the landed cost of the fibre is the largest element of cost, amounting generally to about two-thirds of the sales value of the twine.

The average cost of production together with the manufacturers' portion of distribution costs was nearly 15 cents a pound for baler twine in 1967 and 1968, down from approximately 23 cents a pound in 1964. Ten years ago the cost was 12 cents per pound. The trend in the costs for binder twine, as table 3 indicates, was much the same. These costs include: materials, labour, overhead and general administrative, including management salaries, taxes, utilities, depreciation, interest and financial charges, research and development, as well as the portion of selling and distribution expenses borne by manufacturers.

Table 3

Average Cost of Production and of Manufacturers' Distribution Expenses, Binder and Baler Twine, Canada, Selected Years, 1958-1968

<u>Year</u>	<u>Binder Twine</u> ¢/lb.	<u>Baler Twine</u> ¢/lb.
1958	13	12
1960	15	14
1962	17	15
1964	24	23
1965	21	19
1966	17	15
1967	16	15
1968	16	14

Source: Tariff Board questionnaire

⁽¹⁾ Grace Fibres Canada Ltd., submission to the Board, November 1, 1968

Of the major categories, material costs comprise the highest proportion, ranging from 60 to more than 70 per cent. The year 1964 was exceptional; material costs for baler twine were 78 per cent of total costs; this unusually high level reflected purchases of fibre at very high prices. Manufacturing overhead was the second largest cost component, ranging from about 9 to 16 per cent. The cost of labour engaged in manufacturing varied from 6 to 10 per cent for baler twine during the ten-year period, but was somewhat higher for binder twine, up to 15 per cent at its peak in 1967. The cost to the manufacturers of their selling and distribution activities and of general administration was 5 to 9 per cent of the total cost, roughly one-half of which was for selling and distribution and one-half for general administration.

In 1964, unit costs of production were highest for the decade because, as noted above, of the high price of sisal used in production in that year. The apparent stability of total costs between 1967 and 1968 conceals the very important offset of lower fibre costs by higher other costs. The lower fibre costs tended to be reflected in lower twine prices which left the Canadian manufacturers with virtually no profit or with a loss on their 1968 operations.

Because fibre represents such a large element of cost, the price of twine reflects fairly directly the fluctuations in fibre prices. Also, because the price of the twines in Canada is very sensitive to the price at which imported twines are being offered in the Canadian market, the manufacturers in Canada, in effect, operate on the relatively small margin between the landed cost of their imported raw material, the hard fibres, and the price of imported twines. It is this margin, rather than the price of twine itself, which indicates whether the Canadian industry can expect to be profitable. In this regard, the other costs may be said to amount generally to about six cents a pound or, in some years, somewhat less than that. Thus, six cents a pound, throughout the years, can be said, in a very general way, to be the critical margin between the average selling price of the harvest twines and the cost of the fibre and other materials used in their manufacture. Some examples are given in table 4 of the order of magnitude of this margin over the four years, 1964 to 1968 inclusive. These data are based on weighted annual averages and are illustrative only, not precise accounting records.

Table 4

Margin Between Cost of Materials and Average Unit
Value of Shipments of Harvest Twine, 1964-1968

<u>Year</u>	(1) Cost of <u>Material</u> ¢ per lb.	(2) Unit Value of <u>Shipments</u> ¢ per lb.	Margin: <u>(2) - (1)</u> ¢ per lb.
1964	17.51	22.36	4.85
1965	12.43	19.60	7.17
1966	10.24	16.77	6.53
1967	9.55	15.81	6.26
1968	8.45	14.15	5.70

Source: Tariff Board questionnaire

In 1967, when the average unit value of shipments of harvest twines was 15.8 cents per pound, the cost of sisal and other materials was about 9.5 cents a pound, leaving a margin of 6.3 cents a pound to cover all other costs and profit. Of this amount, approximately 3.7 cents were assigned to manufacturing labour and overhead, almost equally divided between the two.

In 1968, as is apparent in table 4, the cost of fibre declined but the average value of shipments fell off somewhat more, to leave a smaller margin than in 1967. This reduction of the margin became critical in 1968, especially because other costs increased. This increase in cost of production reflected an increase in salaries and wages and in some other elements of cost, but it reflected also, on a unit cost basis, the substantial decline in output in 1968 which resulted in an increased allocation of fixed costs per pound of output. The combination of these factors, as is noted in a subsequent section on the industry's financial position, resulted in an overall loss for the harvest twine industry in 1968.

Employment and Wage Rates

The cost of labour, both in production and in administration, was stressed in the submission of the companies as an element of cost in which they considered they were at a great disadvantage compared particularly with the newer entrants into twine manufacturing in the developing countries. The Canadian manufacturers in 1967 were paying, on average, about \$2.20 per hour, a rate which they noted was several times the going rate in many countries from which imported twine originated. Manufacturing labour accounted for 10 per cent of total costs in 1967, the highest in the decade except for 1958 when it was essentially the same proportion. Indications are that in 1968 the proportion of manufacturing labour in total costs of production was somewhat higher than in 1967.

As the twine manufacturing industry is a highly material-intensive industry, the number of persons directly employed in twine manufacture is relatively few compared with the value of sales. The number has dropped further in recent years because of technological improvements in the industry and the pressure to reduce costs. According to the Cordage Institute of Canada, there were 467 persons employed in the production of binder and baler hard fibre twines in Canada in early 1968, as against 569 in 1963; however, the volume of shipments was also lower by about thirty per cent, based on 1967 results. About 300 of the employees, members of either the United Automobile-Aerospace and Agricultural Implements Workers of America or the United Steelworkers of America, were referred to by a union spokesman as non-supervisory plant employees. This number excludes a small additional number at Doon Twines whose employees are not union members.

A questionnaire by the Tariff Board covered a somewhat larger number than the 300 production workers referred to in the Unions' submission. Details are given in table 5.

Table 5

Number of Production Workers and Average
Hourly Wage Rate, 1958-1968

Year	Total No.	Skilled Males		Unskilled Males		Unskilled Females	
		Av. hourly		Av. hourly		Av. hourly	
		No.	wage \$	No.	wage \$	No.	wage \$
1958	411	28	1.72	291	1.58	92	1.44
1959	407	30	1.80	294	1.68	83	1.53
1960	384	30	1.85	277	1.72	77	1.58
1961	362	30	1.94	271	1.75	61	1.60
1962	420	29	1.98	321	1.84	70	1.73
1963	481	27	2.02	386	1.90	68	1.81
1964	494	25	2.10	403	1.95	66	1.85
1965	387	25	2.18	312	2.00	50	1.90
1966	508	29	2.37	415	2.09	64	1.96
1967	457	32	2.49	373	2.17	52	2.00
1968	352	31	2.70	281	2.33	40	2.15

Source: Tariff Board questionnaire

While the number of skilled employees has remained steady over the past decade, the number of unskilled employees has varied greatly. Peak employment throughout these years was reached in 1966 when it exceeded 500. Reductions in the past two years have been rapid, to bring employment in 1968 to the lowest level in the decade. However, in 1968 one plant was not operating for the full year.

When these fluctuations in employment are compared with those in the quantity and value of shipments, the volatility of sales per person employed is illustrated. It must be borne in mind, however, that fluctuations in the value comparisons reflect changes in the cost of the fibre raw materials. There is, moreover, the substantial impact of changes in inventory valuation resulting from the necessity to buy and stockpile fibres well in advance of the sale of the twine.

Over the decade from 1958 to 1967, shipments of harvest twines from the Canadian producers averaged about 160,000 pounds per worker. In 1958, the shipments per worker were only 147,000 pounds; they reached a peak of 190,000 pounds in 1965, dropped to 150,000 pounds in 1966 but recovered somewhat in 1967 to 171,000 pounds. In 1968, shipments were considerably lower than in 1967.

Although the market for harvest twines is seasonal, the employment was stated to be largely non-seasonal because of the planned production schedules. In this connection the spokesman for the Cordage Institute of Canada stated:

"... the industry I am representing has stated that it has attempted, by producing for stock, to keep a fairly level work force throughout the year, ... while the market was seasonal, the employment was not." (Vol. 3, p. 406)

On the same issue the Union's representative remarked:

"... there have been in the last couple of years, I understand, some shut-downs at Harvester, but basically the industry has attempted to keep the twine mills running all year even though the industry itself is seasonal."

(Vol. 2, p. 308)

Average hourly wage rates have fluctuated but have shown a continuous increase from 1958 to 1968, amounting to about 50 per cent over that period for each of the three categories in table 6. In the past four years, from 1965 to 1968 inclusive, average hourly wage rates for unskilled males, which constitute the bulk of the labour force, increased by about 16.5 per cent. The representative of the two unions to which most of the workers belong stated that the unions do not subscribe to the idea that a low wage level is justified to keep a particular Canadian industry functioning.

Distribution and Service Facilities

The companies producing harvest twine in Canada maintain their own sales and service facilities as a part of their sales policy. These companies have sales and service arrangements all across Canada; either they sell through dealers, jobbers and distributors, or they sell to wholesale or retail dealers, many of whom also sell feed, seed, agricultural implements or automobiles and trucks. The twine manufacturers employ a sales and service staff at their main distribution centres and maintain their own warehouses to stock twine throughout the season and for carry-overs. Some of the staff are technically trained to help farmers or dealers to overcome problems that arise in using the twine.

The companies follow the practice of allowing freight discounts when customers pick up twine with their own trucks; they also allow off-season discounts and, in some cases, bear the cost of carrying over unsold stocks left with dealers. The necessity for this arrangement, even though expensive, was explained by the Cordage Institute of Canada which noted that many of the smaller distribution outlets might be left with large unsold stocks because of the vagaries of the weather. By placing stocks on consignment with them, the risk for the distributors is much reduced. It was observed that, because a large proportion of imported twines are sold to large customers, some of these costs are not borne directly by the importer.

Seasonality of Industry and Inventory Situation

Although Canadian manufacturers of hard fibre twines try to keep their harvest twine operations running throughout the year, they are faced with a fairly short season of sales to farmers, almost entirely between the months of May to September, and mainly in June, July and August. In addition, because of the vagaries of the weather and consequently of haying conditions in different parts of the country, seasonal and regional patterns and the total demand for twine cannot be predicted with accuracy. As noted earlier, harvest twine manufacturers must order supplies of fibres well ahead of the months when the twine is being used. All in all, therefore, seasonal

factors have an important impact on twine manufacturers and are reflected in the stock-sales ratios of the industry. Ratios of the volume of inventory to shipments have been as high as 75 per cent for binder twine in recent years, and over 55 per cent for baler twine, as shown in table 6. Even at their lowest point during the year, inventories typically are 20 to 30 per cent of annual sales.

Table 6

Ratio of Inventory to Factory Shipments, Hard Fibre
Harvest Twines, Canada, 1963-1967

<u>Year</u>	<u>Binder Twine</u>		<u>Baler Twine</u>	
	<u>Maximum</u>	<u>Minimum</u>	<u>Maximum</u>	<u>Minimum</u>
1963	39.8	12.6	26.8	11.2
1964	55.1	31.7	48.2	32.3
1965	74.7	30.7	44.3	25.0
1966	43.0	25.2	32.9	18.8
1967	69.1	34.1	55.8	36.3

Source: Tariff Board questionnaire

THE SUPPLY AND DISPOSITION OF HARVEST TWINES

Among the salient features of the harvest twine market are its highly seasonal nature, the variations in demand from year to year as weather conditions and other factors affect the crops, fluctuations in the supply and demand of fibre and twine accompanied, in periods of over-supply, by severe competition and declining prices, and by rising prices in periods of world shortages. Distribution expenses, service requirements and export markets also are factors of importance to the twine industry.

The principal season in which harvest twines are used is from May to September. To cope with this seasonality, and the uncertainty of the amount of twine which will be required in any year and in any part of the country, producers may either maintain large inventories or equip and operate their plants so as to make supplies available on short notice. As far as possible, companies obtain advance orders and arrange sales contracts for the entire season. As a complementary policy, they often arrange for the return of stocks left in the hands of the dealers at the end of the season or arrange to leave these with the dealers on a consignment basis.

These problems of variations in demand are complicated for the Canadian producers of harvest twine by the availability of supplies from a large number of sources outside Canada all of which are looking principally to the North American market for the disposal of their production of harvest twines. The supplying countries in total were said to have substantial over-capacity to produce harvest twines and some of the countries have a particular incentive to sell because the economies of the countries are greatly affected by their production of sisal from which they make their twine.

The need to supply service and to keep closely in touch with dealers and farmers in the use of harvest twine was mentioned by the Canadian manufacturers as an important feature of the marketing and distribution arrangements. Provision of this service was said to help maintain markets in Canada and the U.S.A. for the Canadian harvest twine manufacturers, but it was noted by the Canadian manufacturers that they tended to be called upon to provide this service even for small sales, whereas the imported twines were generally sold and distributed through large farm or dealer organizations without such follow-up service on the part of the importer.

As has been previously noted, the market requirements for binder and baler twines have reversed over the past two decades. In 1951, for example, shipments of binder twine from Canadian factories amounted to nearly 66 million pounds and of baler twine, only 16 million pounds. In 1966, shipments of baler twine amounted to 67 million pounds, and of binder twine, less than 9 million pounds. The fortunes of the industry, therefore, are now determined almost entirely by the market for baler twine and by the industry's competitive position in that market at home and abroad. In this section, the supply and disappearance of binder and baler twine are, for the most part, considered together but, in the critical recent years, the aggregate reflects very largely the developments which have been taking place for baler twine. Further statistical information on binder twine and baler twine is presented in Appendix (1).

Table 7

Supply and Disappearance of Harvest Twines,
Selected Years, 1955-1968

Year	Shipments		Net Imports ^(a)		Exports		Apparent Consumption ^(c)	
	(mn. lb.)	(mn. \$)	(mn. lb.)	(mn. \$)	(mn. lb.)	(mn. \$)	(mn. lb.)	(mn. \$)
1955	58.0	7.4	10.0	1.3	27.1	4.2	40.9	4.5
1957	61.4	8.5	14.2	1.9	23.3	3.7	52.3	6.8
1960	56.0	8.4	23.2	3.1	19.9	3.1	59.3	8.4
1963	81.8	14.2	23.7	3.9	30.5	5.5	75.0	12.5
1964	71.0	15.2	33.0	6.6	26.3	5.6	77.7	16.2
1965	73.7	14.5	31.5	5.6	43.4	8.2	61.8	11.8
1966	76.2	12.5	40.1	5.8	38.6	6.3	77.7	11.9
1967	60.2	9.6	51.2	6.9	25.1	3.9	86.3	12.6
1968 ^(b)	48.0	6.8	46.8	5.5	18.0	2.8	76.8	9.5

(a) Total imports less re-exports

(b) Shipments data from Tariff Board questionnaire

(c) The value data are distorted by differences in valuation in the various columns

Source: Based on D.B.S. publications and Tariff Board questionnaire

It is apparent from table 7 that shipments from the Canadian industry reached a peak in 1963 and, after some fairly moderate decline to 1966, dropped off sharply in 1967 and 1968. This decline in shipments, at a time when the market for harvest twines in Canada and the U.S.A. was relatively large, reflected two influences: the rising share of imports in the Canadian market and the decline in Canada's exports of harvest twines to the U.S.A. In quantity terms, imports, which had supplied about one-quarter of Canada's requirements of harvest twines a decade ago, now supply more than 60 per cent. When compared with the production of harvest twines by the Canadian industry, the increasing significance of imports is even more apparent. Imports were less than 20 per cent of the volume of shipments from the Canadian industry in 1955, but were over 85 per cent of that volume in 1967, and were about the same as Canadian shipments in 1968.

As a result of the increasing imports from other countries into both the Canadian and U.S. markets, shipments of harvest twines by the Canadian industry in 1967 had fallen approximately to their level of ten years earlier, although they had been substantially higher, in total, throughout the years 1962 to 1966 inclusive. Moreover, as the later examination of earnings shows, the profits of the industry in 1967 apparently were not unlike those of a decade earlier, and were smaller than they had been in two or three of the intervening years, and particularly than in 1965. These conditions were seriously aggravated by the further deterioration of the industry's fortunes in 1968. In that year, a substantial decline in shipments from the Canadian industry occurred along with a further decline in the price of harvest twines. Part of the decline in output reflected a reduction in the size of the Canadian market in 1968, but the largest part of the decline resulted from the much

lower exports by the Canadian industry. Thus, exports of harvest twines were only about 18 million pounds in 1968, a decline of over 7 million pounds in that one year and of more than 20 million pounds over a two-year period; this two-year decline in exports was equivalent to more than one-quarter of the total shipments of the industry in 1966.

Throughout the latter part of the 1950's, exports of harvest twine to the U.S.A., the only important export market for Canadian twine, had regularly exceeded imports into Canada from all countries by a substantial amount. By 1960, however, a net import balance had been established which carried through most of the subsequent years. Exports in 1967 and 1968 still provided an outlet for a substantial part of total shipments, though in 1968 the proportion declined very appreciably.

The U.S. market had become an important outlet for the Canadian producers of harvest twine throughout the 1950's as the number of producers of harvest twine in that country declined and as the use of baler twine increased rapidly throughout the 1950's and early 1960's. The Canadian industry was well located; it had close associations with the U.S. market and could readily supply a large segment of that market as production in the U.S.A. declined. Total imports into the U.S.A. came to supply 85 per cent or more of the U.S. market during the 1960's. In 1966, Canada supplied 14 per cent of the imports into the U.S.A., a somewhat smaller proportion than Portugal and well below the 28 per cent coming from Mexico. However, in the first nine months of 1968, the share of total U.S. imports coming from Canada declined to approximately 6 per cent, and newer producing countries such as Angola, Kenya, Mozambique and Tanzania, in total, supplied nearly 13 per cent.

The Canadian industry, therefore, in the years 1967 and 1968 felt the combined impact of the decline in its sales in Canada and in its exports. The decline in the volume of output appeared to be the most important single cause of the financial losses sustained by the industry in 1968; a significant part of the decline in shipments reflected a further decrease in export sales.

It is not unusual for an industry tied so closely to an agricultural product to experience wide fluctuations in the price of both the raw material which it uses and the product which it manufactures. This matter is dealt with later in this section but the variations in the unit values of shipments, exports, imports and of apparent domestic consumption can be reckoned from the quantity and value data given in table 7. Because the price of the harvest twine generally reflects fairly closely (possibly with some lag in timing) the cost of the fibre used in its production, the analysis of the changes in value, as they have affected the Canadian industry, also is dealt with in the context of the later price and cost analysis.

The Market in Canada by Region

The available information, while not entirely complete, indicates that about 60 per cent of the Canadian market for binder and baler twine is in Ontario and Quebec, the Ontario market being somewhat the larger. More than 30 per cent of the market is in the prairie provinces, roughly the same proportion as Ontario and Quebec taken

separately. The remainder, approximately 10 per cent of the total market, is almost equally divided between the Atlantic provinces and British Columbia. The proportion of imports entering Ontario and Quebec is almost the same as the proportion of the market in these provinces. However, a much larger proportion (about one-quarter) of total imports is entered in British Columbia than its share of the market would justify; these importations are principally for sale throughout the prairie region.

On the regional concentration of the market, the spokesman for the Cordage Institute of Canada stated at the public hearing:

"... the total production [of hay] in Canada in 1967 was in the neighbourhood of 25 million tons. Ontario and Quebec accounted for over 16 million tons of that. Again, this is to give you an idea of concentration. The reference to binder twine and the picture of wheat production in Western Canada can inadvertently influence you into thinking of the west as the market but the big market that we are talking about, the big volume, is baler twine and it is related to a central Canada market which dominates the country."

(Vol. 1, p. 113)

The manufacturers of twine in Canada do not consider that they derive any advantage against imports, even in Ontario and Quebec, from transportation costs. This conclusion follows from the fact that they pay no lower transportation costs on the fibre which they import than is paid on the twine imported from a manufacturer located in the fibre-producing country. The Canadian twine manufacturers in fact submitted that in some instances the transportation costs on the twine, into market areas near the Canadian plants, were somewhat lower than those for the fibre which they imported to make the twine. This matter is dealt with further in a subsequent note on transportation.

Imports of Harvest Twines

The increase in the quantity of imports of harvest twines resulted from the increase in imports of baler twine at a time when imports of binder twine, in keeping with market developments, were declining. Imports of binder twine, in 1967 and 1968, were valued at only about \$200,000 per year compared with an annual value of imports of baler twine of the order of \$6 to \$7 million. For simplicity of presentation, the imports are here considered in terms only of baler twine.

For baler twine, new sources of supply were stressed as an important factor, though some of the suppliers of longer standing continued to dominate Canada's imports. In 1967, Portugal supplied the largest portion, nearly 30 per cent of the imports. Other countries of Western Europe, together, also continued to be important sources of supply of baler twine, though less so than in earlier years. In 1967, for example, Britain, Belgium and Luxembourg, Denmark and the Netherlands together supplied about 21 per cent of Canada's imports compared with 37 per cent as recently as 1963. Countries which have become suppliers of baler twine since 1964 include: Tanzania, Angola, Brazil, Kenya and Mozambique; together they accounted for nearly one-third of Canada's imports in 1968; of this amount, Tanzania accounted

for more than one-half. The other noteworthy sources of imports were Mexico and Cuba, both of which had been suppliers of long standing.

The relative order of importance of the newer and the older sources of supply becomes apparent when their contributions to the increase in imports is examined. For example, imports of baler twine were about 20 million pounds higher in 1967 than in 1965; the increase in imports from the newer sources of supply in Africa amounted to about 8.5 million pounds and from Brazil, about 2.2 million pounds. Imports from the more traditional sources of supply in Western Europe increased by about 4.6 million pounds over this period, from Mexico by about 4.2 million pounds, and from Cuba by just over one million pounds. In 1968, available data indicate a fairly substantial decline in total imports which reflected principally lower imports from Portugal and the other countries of Western Europe, and also from Brazil. On the other hand, imports from the countries of Africa showed a significant increase in spite of the overall decline in imports, and imports from Mexico and Cuba were slightly higher in 1968 than in 1967.

It seems apparent, therefore, that the Canadian industry began to experience in 1967 the substantial impact of the industry which had developed in African countries and by 1968 this impact had become even more pronounced. In the latter year, imports from Africa equalled those from Portugal and exceeded slightly total imports from Mexico, Cuba and Brazil.

Some of the representatives of suppliers in Western Europe also regarded the increase of imports into Canada from Mexico as a serious source of competition. One or two of these representatives drew attention to imports, particularly from Mexico, of one or more of the Canadian twine manufacturers. Some of the manufacturers of twine in Canada have imported twine for a number of years, thus supplementing the supplies available from their own production. The quantities imported by the manufacturers typically are well under 15 per cent of total imports and in 1968 were less than 10 per cent. Manufacturers have imported from time to time from different countries but a large part has usually come from Mexico. The prices paid by manufacturers for the twine they import appear to be similar to the prices paid by many of the other importers having regard to the countries of origin. Some of the other importers have fairly direct association with Canadian farmers and are in a position to place large orders; most notable of these is the Interprovincial Cooperatives Ltd.

Prices and Pricing Policy

Another factor in the changing import competition is the difference in the price of imports of harvest twines as between the different exporting countries. Some indication of these differences may be derived from the unit values of imports from the various sources of supply. These values indicate the price in the country of export; a comparison of them will not, therefore, reflect any differences that exist from one country to another, in the cost of getting the twine to the Canadian market. The unit values of imports from a

number of countries are given in table 8, from which it may be seen that imports from some of the newer sources of supply have tended, in recent years, to have lower unit values than imports from some of the sources of longer standing. As noted above, imports from these countries have been increasing, along with those from Mexico, which also tends to have unit values somewhat lower than the average for all imports into Canada.

Table 8

The Unit Value of Imports of Baler Twine
from Selected Countries, 1965-1968

<u>Country</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
		- cents per lb. -		
Total Imports	17.73	14.47	13.55	11.76
Portugal	16.63	14.84	14.01	12.14
Other West Europe	19.02	15.27	14.46	12.90
Mexico	17.29	13.62	12.59	11.34
Cuba	16.44	12.92	11.43	11.20
Brazil	..	13.21	11.97	8.28
Tanzania	17.22	13.51	12.90	10.66
Angola	..	12.64	13.63	12.62

Source: D.B.S., Trade of Canada

The above discussion of the market has been principally in terms of quantities of twine; the magnitude of the market in value terms may be considered in the context of the prices of harvest twines and the costs of the fibres from which they are manufactured.

It may be observed from the preceding table 7 and from the data in Appendix (1) that the apparent annual Canadian market for harvest twines was approximately \$12 million in the years 1965 to 1967, an amount well above that in the late 1950's and 1960. Similarly, in the years 1963 to 1965, the value of shipments from the Canadian industry, of more than \$14 million a year, was much higher than it had been in the preceding years. The value of shipments declined, and in 1967 was approximately equal to that of the earlier years; however, in 1968 shipments took a further sharp decline, to a level well below that of any year in the 1950's or the 1960's up to that time. This sharp decline in the value of shipments reflected, in part, the reductions in the volume of exports of harvest twines, as noted in the preceding section. The declines in value, however, also reflected lower prices in 1968.

In a highly competitive and a relatively short seasonal market, with a large number of buyers and sellers, with different brands and makes of twine in the market, price competition tends to be keen for binder and baler twine. In the existing competitive situation, no single price prevails; a buyer might secure several different price quotations at the same time, none of which necessarily will be the "list price". Price concessions are made for large quantity purchases, for off-season purchases, for cash and prepayment

discounts, or in other forms such as freight and inventory allowances or carry-over credits. The quantity discount alone might range from 25 cents to 50 cents for a 40-lb. package of twine. The representative list prices given in table 9 show the great fluctuations in price from one year to another. Further price information on harvest twines is given in Appendix (1). As noted above, these list prices do not represent the actual return received by the twine manufacturers. Some indication of the difference is given by the average selling prices in table 9.

Table 9

Average List Prices and Average Selling Prices for Baler
and Binder Twine, Selected Years, 1947-1968

	Baler Twine		Binder Twine	
	(9,000 ft. per pkg.)		(600 ft. per lb.)	
	Average		Average	
	List Price	Selling Price	List Price	Selling Price
	(\$ per 40-lb. package)		(\$ per 50-lb. package)	
1947	8.80	..	9.00	..
1950	10.40	..	12.50	..
1952	16.80	..	18.75	..
1955	8.25	..	9.65	..
1960	7.75	6.77	8.85	8.00
1963	9.65	7.77	11.30	9.44
1964	10.80	9.55	12.80	11.28
1965	9.70	8.23	11.40	10.75
1966	8.20	7.13	10.40	9.32
1967	7.90	6.61	10.20	8.72
1968	6.85	5.92	9.70	8.70

Note: List prices: delivered, distribution points Eastern Canada, Lakehead and Vancouver. These are maximum prices subject to varying trade and quantity discounts. (Vol. 1, p. 31, 32)
Average selling prices: f.o.b. plant, as reported by companies to the Tariff Board

It may be observed from table 9 that the list prices in 1964 were more than forty per cent higher than in 1960 but that, subsequently, there has been a continuous sharp decline until, in 1968, the lowest prices for baler twine in two decades were reached. Moreover, the returns received by the manufacturers, represented by the average selling prices, were \$5.92 per 40-lb. package of baler twine in 1968, the lowest of any of the years shown.

Within Canada, there are regional differences in prices; those in the vicinity of the Alberta-Saskatchewan border were said to be generally the highest. To a large extent this results from the cost of transportation to that region from the principal sources of supply in Ontario or of imports from the west coast. For example, a survey of prices conducted by the Cordage Institute in 1968 indicated, for Canada as a whole, an average retail price to the consumer of \$7.35 per 40-lb. package of baler twine of Canadian manufacture. In

Alberta, the average price was \$7.84, in Saskatchewan, \$7.57, in Ontario, \$6.55, and in Quebec, \$6.56. The retail price for imported twine, by the same survey, was lower than that for twine of Canadian manufacture; for example, the average price for imported baler twine for Canada as a whole was \$6.55 per 40-lb. package compared with the \$7.35, domestic, noted above.

The recent decline in the prices received by Canadian producers was said to have been greater in Canada than in the U.S.A.; this resulted in part from the proportionately greater impact on the Canadian market of price competition from new sources of supply abroad, as well as the competition among the four producers in this country. The effect of this decline on the Canadian industry was expressed by a spokesman for the Cordage Institute of Canada, in the following way:

"... if prices of all types of twine, not only Canadian but those that are imported into this country were to be maintained at their present level it would be a question of just a few years when the industry would be desperate."

(Vol. 1, p. 129)

Spokesmen for some of the traditional suppliers of imported twines noted that the decline in twine prices in Canada was having a serious effect on their business as well as on that of the Canadian twine manufacturers. These suppliers of imported twine noted that the price declines did not result from the initiative of the European suppliers of long standing.

In this connection, the submission of J.E. Derenne Limited, the representative in Canada of a group of Belgian twine manufacturers, stated that the Belgian pricing policy always had been conservative and that year after year twine imported from Belgium could not compete with the conditions offered by the Canadian manufacturers of baler twine. These conditions were said to include large rebates for freight costs, free financing for the dealer of unsold stock at the end of the season, sales assistance and advertising. The Belgian group noted that imports into Canada in 1968 from seven traditional European suppliers had dropped by 40 to 50 per cent but that imports from some other countries had increased. The spokesman noted particularly the increased imports from Mexico, a large part of which he ascribed to imports made by "the largest Canadian manufacturer". The spokesman for J.E. Derenne went on to say:

"Well, until two or three years ago we were suffering mostly from the competition of Tymex [Mexican twine], but last year and this year and even two years ago there were other imports from which we suffer a great deal also, exactly the same as the Canadian manufacturers have been suffering."

(Vol. 4, p. 638)

The retail prices in Canada of twine imported from the United Kingdom ("Bluebell" brand) were also stated to be higher at times than those of Canadian manufactured twine. In this connection the spokesman for the U.K. Cordage Manufacturers' Export Group stated that the policy of the Group was to get the same price as the Canadian manufacturers and that at times the price of twine from Britain might be a few cents higher than that from the Canadian manufacturers.

In regard to the prices of twine imported from Denmark, the spokesman for DANCORD, Danish Cordage Manufacturers Associated, noted that their prices also were usually about equal to the prices of Canadian manufactured twine but stated that in 1968 there were instances when the price of Canadian twine had been considerably below that of the Danish product.

The basic pricing policy adopted by the manufacturers and importers of harvest twine was expressed in terms of meeting the competitive price prevailing in the market at a point of time.

Twine Prices and Fibres Prices

Fluctuations in the price of twine tend to follow closely the changes which are taking place in the prices of the hard fibres; the cost of the fibres generally represents 60 per cent to 70 per cent of the selling price of the twine. The magnitude of the relatively small difference, or margin, between the fibre cost and the twine prices, as has been noted, is a matter of prime importance to the manufacturer; it is out of this margin that he must meet all of his other costs and realize whatever profit or loss he is to receive from the operation. Moreover, because the fibre raw materials are all imported, and because the manufacturer faces very substantial competition from imported twine, he is confronted by a cost-price relationship which can change suddenly, for better or for worse, from one year to the next, or even within the course of a single year, and over which he cannot exercise much control. The changes in the unit value of imports of hard fibres and of shipments of harvest twines are apparent from table 10. The relationship between the two is not constant for a number of reasons related to buying policies, rates of production, inventory holdings and the strength or weakness of the market for twine; moreover, because fibre values are given as at point of shipment for export, changes in transportation and handling costs of the fibre will affect the relationship.

Table 10

The Unit Value of Imports of Hard Fibres, and of Harvest Twines,
and of Shipments of Harvest Twines, 1958-1968

Year	Hard Fibres ^(a) (1)	Binder Twine		Baler Twine		Difference:	
		Imports	Shipments	Imports	Shipments	(4)-(1)	(5)-(1)
		(2)	(3)	(4)	(5)		
		- cents per lb.		-			
1958	7.5	12.8	13.4	12.8	13.5	5.3	6.0
1959	8.2	12.8	13.4	12.6	13.8	4.4	5.6
1960	10.3	14.4	15.4	13.2	14.8	2.9	4.5
1961	10.2	14.9	16.2	14.9	15.6	4.7	5.4
1962	10.5	15.0	15.3	14.9	14.9	4.4	4.4
1963	15.1	17.4	16.7	16.4	17.5	1.3	2.4
1964	17.3	19.9	21.5	20.1	21.4	2.8	4.1
1965	10.5	20.9	20.2	17.7	19.5	7.2	9.0
1966	9.6	18.0	17.2	14.5	16.3	4.9	6.7
1967	8.1	14.7	16.6	13.6	15.8	5.5	7.7
1968	7.6	13.2	15.7	11.8	14.0	4.2	6.4

(a) Includes, in addition to sisal and henequen, small quantities of other hard fibres, for example istle and tampico

Source: Based on D.B.S. data and Tariff Board questionnaire

The data in table 10 are not fully representative of the gross margin available to the producer in Canada after purchasing the fibre from which the twine is to be manufactured; as noted above, the fibre is priced at point of shipment in the country of export and will be higher in cost when landed at the twine producer's plant in Canada. The generally lower margin for imported twine than for that manufactured in Canada results, in large part, from the fact that the imports are priced at their point of origin abroad; imported twines also will have higher unit values at the point of competition with Canadian twines in markets in Canada and the U.S.A. Other information available to the Board indicates that, generally, the price of imported twine in the Canadian market, under the same conditions of sale, often differs very little from that from Canadian producers, though this result may be obtained by reductions in prices of harvest twine from the Canadian industry to meet lower quotations on imported twine.

It is evident from the table that the decline in prices in recent years reflected mainly the decline in fibre prices, and that the margin between the two, while smaller in 1966-68 than it had been in the unusually favourable year of 1965, had not fallen below what it had been in earlier years. A somewhat more detailed presentation of the changes in this gross margin for the years 1964-68 is given below in the discussion of the industry's financial position; however, it does not alter appreciably an interpretation based upon the data in table 10. It is evident that, although the industry had experienced a very substantial decline in the prices of its products throughout the years 1966-68, and had a much smaller gross operating margin in 1968 than in 1965, this development alone could not have caused the serious deterioration in the industry's position; the operating margin in 1968, even after the declines, remained higher than it had been in any year in the first half of the past decade, years in which the industry, for the most part, was in a fairly satisfactory financial state.

It was not, therefore, the sharply declining prices, taken by themselves, that was causing the industry's distress in 1968. The combination of the impact of declining prices and of the declining volume of shipments are examined in the following section dealing with the industry's financial position.

THE INDUSTRY'S FINANCIAL POSITION

The previous analysis has shown that in 1967 and 1968 the Canadian harvest twine industry experienced a sharp decline in shipments, as well as a further decline in the price of its products and in the margin, or differential, between the average returns from the sale of harvest twines and the cost of the fibre and other materials used in their manufacture. These developments can be examined in terms of the earnings of the industry.

In table 11, the decline in the operating margin between the average returns received by the manufacturers for the twine they sold and the cost of materials is compared with other costs of manufacture, overhead and distribution. The volume of shipments of harvest twine is also shown so that fluctuations in these two important factors may be examined together.

Table 11

Comparison of the Operating Margin and Costs of Manufacture and Volume of Shipments of Harvest Twine, Selected Years, 1964-1968

	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(4)</u>	<u>(5)</u>
	Gross Margin ^(a)	Costs of Mfg. & Sale ^(b)	Difference (Net Margin)	Shipments of Harvest Twine	(3) x (4)
	- cents	per lb. -	(1) - (2)	(million lb.)	(\$'000)
1964	4.9	5.2	(-0.3)	71	(-213)
1965	7.2	5.3	1.9	74	1,401
1966	6.5	5.1	1.4	76	1,067
1967	6.3	5.5	0.8	60	481
1968(c)	5.7	6.1	-0.4	48	-192

(a) Average selling value of twine less cost of materials; weighted averages are used based on company information

(b) Costs of manufacture, overhead and manufacturers' distribution expenses; weighted averages as in (a)

(c) Based on incomplete data

Source: D.B.S. data and Tariff Board questionnaire

The data in table 11 illustrate some of the changes which have affected the companies over the past five years. In general, it may be seen that both the gross operating margin and the volume of shipments were high in 1965 and 1966 in comparison with those in the following years. Declines took place in 1967 but, in terms of both the gross margin and the volume of shipments, 1967 was not unlike some of the earlier years; even with some increase in unit costs over the period, the companies, for the most part, were able to realize a net margin over costs in 1967 sufficient to achieve a profit.

If the 1967 position were taken as representing a minimum position sufficient to sustain the industry in its present form and with the cost structure as at that time, the four companies would seem to require an annual output of harvest twines of about 60 million pounds and an operating margin between cost of fibre and the average realized price of harvest twine in excess of six cents a pound. In terms of the costs and prices of a bale of harvest twine, in 1967, the relationship is illustrated by a cost of materials of just over \$3.80 for a 40-lb. bale of baler twine and an average realized selling price of twine of about \$6.60 per bale. This twine had a list price of about \$7.90 per bale. These conditions did not prevail in 1968.

The data in table 11 indicate that, in 1968, the decline in the gross margin between selling prices and costs of material continued at a time when the volume of shipments fell off substantially, to the lowest level in the decade. Undoubtedly reflecting, in large part, the much lower production, unit costs, other than materials, increased appreciably from 1967 to 1968 and, in the latter year, exceeded the margin available to cover them. For the industry as a whole, therefore, a loss was sustained in 1968 and no company reported more than the most modest of profits on harvest twine operations in 1968.

The outlook for 1969 appears to be for something of a continuation of the 1968 circumstances. Some slight firming of fibre prices occurred in the latter part of 1968 but there is no clear indication of the extent to which these prices will remain at the slightly higher levels. Even more important to the Canadian industry is the absence of any sign that prices of imported twines will be any higher than in 1968; they may even be lower. Early price quotations in the U.S.A. indicate significant declines in prices in that important market. In addition, the Canadian harvest twine industry anticipates lower shipments for the 1969 season than it had in 1968. If these conditions prevail throughout 1969, the harvest twine industry in Canada would seem to be facing losses at least as great as in 1968.

When the net margin per pound of production is applied to the total production of the industry some indication is given of the magnitude of net earnings which might be realized in any given year. A rough approximation of these earnings is given in column 5 of table 11, illustrative of the trend in earnings which developed from year to year. These data will not agree with the net profits of the industry for a number of reasons, one important one being the changes in inventory and in inventory valuations. There are also other adjustments which companies might make for purposes of corporate accounting. The data in column 5 of table 11 suggest that, after a loss in 1964, the industry had two very profitable years in 1965 and 1966 but that the trend in earnings declined sharply in 1967 and, as noted above, turned into a loss position in 1968.

The other information available to the Board on the net earnings of the industry does not lend itself to tabular presentation because of various corporate changes over the period and because of changes in accounting procedures and in other factors. However, in very broad terms, the industry achieved profits before payment of corporate income tax in excess of one million dollars in 1958; profits declined over the next few years, and were of the order of \$500,000 in 1960 and 1962. Losses were experienced in 1964 greater in amount than

the calculations in table 11 suggest. These losses, as has been previously noted, reflected principally a sharp decline in the price of fibres in that year, from the high previous levels, and consequent losses recorded on inventory valuation. Some of the much improved performance in 1965 resulted from some offsetting gains in inventory valuation; profits much higher than in any other year in the decade were carried on company books in 1965. In 1966, profits were of somewhat the same order as they had been in 1958, that is, approximately one million dollars. In 1967, profits declined sharply but exceeded \$200,000 before tax. In 1968, as noted above, the smaller gross margin between material costs and selling prices combined with a severe decline in output to bring the industry into a loss position. Indications are that the situation in the current year will not be an improvement over that in 1968 unless market conditions change favourably in some way not at present foreseen by the industry.

Spokesmen for the industry did not consider that a reduction in the number of producers would offer a lasting solution to the present unsatisfactory financial position of the industry. No reasons were advanced dealing specifically with this observation; presumably it is based to some considerable extent on the realization that many of the competitive factors which confront the industry arise outside of Canada and cannot be influenced to any appreciable extent by the actions of companies in this country. Thus, further declines could occur in the price of the twines which could cause a further loss of export sales, tend to increase imports into Canada and, possibly, reduce further the operating margin between cost of fibre and selling value of the harvest twines.

On the other hand, some further consolidation of production might offer a greater opportunity for one or two companies to establish moderately profitable operations, although they might still encounter difficulties.

Because the four companies of the harvest twine industry manufacture other products, the unsatisfactory earnings experienced by them in the manufacture of harvest twines will not, of themselves, necessarily determine the survival of the companies. The losses sustained on the harvest twine operations will affect the companies in different degrees. Over the past four or five years all of the companies have reduced their dependence on harvest twines to an appreciable extent but for three of the manufacturers the volume of harvest twine production is regarded as an important factor in the overall company operation; the complete loss of harvest twine production, as a result of a continuing unprofitable position, is regarded by these companies as a serious possible development.

The difficulties which had beset producers in the U.S.A. and in some of the countries in western Europe had resulted in considerable contraction of the harvest twine industry in those countries. For example, in the U.S.A., the number of producers of harvest twine had been reduced from seven in 1951, to four in 1957 and to one in 1967, a plant operated by the International Harvester Co. in New Orleans, La. In Britain, ten years ago there were ten companies; there are now only three. In Belgium the seven or eight companies in existence about seven years ago had been reduced by consolidation to two groups. In Mexico, prior to 1961, there were approximately 39 mills operating; there are now

five, and a further consolidation to two mills was said to be planned. Even in Tanzania, where the industry is of recent origin, five mills were originally set up, but only four have survived. As a result of these developments an increasing proportion of world total output is coming from newer producing countries and, in total, there exists over-capacity for the production of harvest twine; the Cordage Institute quoted an estimate of world capacity in excess of 2 billion pounds a year as against an estimate of consumption of just over one billion pounds.

THE COMPETITIVE POSITION OF THE CANADIAN INDUSTRY

It is evident that by 1968 the Canadian industry was not competing profitably in the North American markets. Over the past three years, prices of harvest twines declined and imports into Canada and into the U.S.A. from other countries than Canada came to supply the predominant part of both markets.

These changes result principally from the entry into the manufacture of harvest twines of new producers located favourably to take advantage of local fibre production, producers who, for the most part, make use of machinery and equipment at least as advanced as that in use in Canada. Wage rates in the newer countries are much lower than rates in Canada and, even though productivity in the Canadian industry might, as claimed, be higher than in most other places, it is not sufficiently higher to offset lower wage rates. Moreover, the differential in productivity can be expected to diminish as the newer producers gain experience in the manufacture and sale of harvest twines.

In many of the newer producing countries there is an important incentive for governments and industry to encourage the expansion of twine manufacture. Not only does the manufacture of twine represent an obvious upgrading of the indigenous agricultural product and additional employment of local labour but also, at the time of the inception of the industry in those countries, it appeared to offer a way to ensure disposal of a particular country's fibre in world markets by selling it as twine, in the manufacture of which the fibre-producing country might expect to have an advantage.

The overall result of changes in fibre and twine production was the creation of a position of over-supply, particularly of the sisal and henequen fibres. In this context, the difficulties encountered by the harvest twine industry in Canada are a part of a worldwide situation which cannot be satisfactory for any of the producing countries and which has resulted in low prices for the fibres and the harvest twines.

Reference was made earlier in this report to efforts by a study group of the Food and Agriculture Organization (FAO) to bring about more orderly conditions in the supply of both the fibres and the twine with a view to achieving a price structure which did not bring distress to the fibre-producing, agricultural economies, nor create shortages and unduly high prices for the users of the products: in this instance, other farmers who use harvest twines. Some of the difficulties encountered by the FAO study group are illustrated in the trend of sisal prices in recent years.

In September, 1967, the Study Group recommended an indicated price of £79 7s. per long ton, c.i.f. Europe, for East African sisal. This was revised downward in 1968 to £68 with an indicated price of £72 for the spring of 1969. Also in September, 1967, the producing countries agreed to export quotas for both sisal and sisal manufactures of 640,000 tons. In view of the continuing excess supply and the fact that prices had failed to rise to the indicated price, the export quotas were reduced, in June, 1968, to 576,000 tons for 1969.

Generally speaking, when conditions of over-supply prevail in the fibre-producing countries and prices are low, the manufacturers of twine in Canada and in the other industrialized countries are at a greater disadvantage than when shortages exist and prices are high. However, as more capacity to manufacture twine is established in the newer producing countries even higher prices might not help the Canadian industry; in periods of shortage, the twine industry in the fibre-producing countries might well have first call on the available fibre, as appears to have already happened in Mexico.

In one other respect, an increase in the prices of sisal, henequen and of twines made from them might lead to a different situation now than it did in earlier years; higher prices will make more probable the growth of competition from twines made from synthetic fibres.

Competition from Synthetics

At present, twines made from fibres or filaments of synthetic resins and other balings made from synthetic materials are not a significant factor in the world supply of harvest twines. The FAO Study Group, referred to above, in its report of September, 1967, summed up the situation in the following way:

"For agricultural twines ... the inroads of synthetics up to the present had been small."

The report also noted that:

"Hard fibres seemed to have few special qualities which would enable them to retain at least a share of the cordage market if their prices became higher than those of synthetic substitutes."

A number of different types of harvest twines and balings produced from synthetic resin, usually polypropylene, are being tested and some have gained part of the commercial market in the U.S.A., Europe and Canada. In the U.S.A., synthetic twines or balings now supply perhaps 5 per cent of the market and some were said to be offered at prices identical with sisal twines. In Canada, Poli-Twine Corporation sells some synthetic baling in the area around Saskatoon; other companies are experimenting with its use in Canada and, possibly, are selling small amounts. Speaking more generally about the impact of synthetic balings and of the small quantities of synthetic balings which are imported into Canada, a spokesman for the Canadian Federation of Agriculture commented:

"I think they are highly overpriced ... and do not make any impact on the market at all." (Vol. 5, p. 926)

The harvest twines and balings from synthetic resins, however, gain some importance by being available if the price of twines from natural fibres should again increase. The Canadian harvest twine industry expressed the view that the price of twines made from natural fibres could not increase greatly without encouraging a significant increase in the use of twines or balings made from synthetic resins. Some of the existing manufacturers of harvest twines might hope to gain

from this shift in use but they might also face competition from other companies, in Canada or abroad, not now manufacturing harvest twines but making other products by the extrusion of synthetic resins. These other companies, familiar with the technology and having experience in the use of synthetic resins, might offer serious competition to the existing harvest twine industry, particularly if the price of harvest twines were to increase by any large amount.

Freight Rates and Their Impact

One factor which frequently offers a form of protection to Canadian producers serving the market in Canada and, possibly, that in neighbouring areas of the U.S.A., is the cost of transportation, or the problems of transportation, which must be overcome by suppliers located less favourably.

The harvest twine industry, however, claimed to gain no advantage from transportation. Both the fibre and the twine are readily transported as bulk cargo with few special requirements of packaging, handling, storing, speed of delivery or of use. In this respect, too, the finished product, the twine, is not much different from the fibre material. The industry claimed, in fact, that the advantage tended to rest with the importers of twine into Canada rather than with the Canadian industry importing the fibre.

Harvest twine is transported in Canada via rail, ship or motor truck. Within Canada, the twines move under specially classified rates at agreed charges between the shippers and the carriers, including, at times, steamship lines for inland waterways. Agreed rates have been established on 50,000-pound and 100,000-pound lots, from Brantford, Hamilton, Kitchener and Welland to various destinations in western Canada. Rail rates are available from Hamilton to certain points in eastern Canada. Rates are also available from Vancouver and Fort William to various destinations in western Canada. Representative examples of these rates are given in appendix (1). There was an average increase of 10 per cent in the agreed rates from central to western Canada during the five year period from 1963 to 1968 and an increase of 17 per cent to other points.

Freight rates on ocean shipping are frequently expressed on a long-ton (2,240 lb.) basis. In table 12, these rates and the rates within Canada have been expressed in terms of a 40-pound bale. Conference rates are used in the table and the averages are based upon the highest rates quoted by the various suppliers, domestic or foreign; the actual rates paid, in many instances, may be below these and the comparison in the table probably is biased toward relatively higher rates from exporting countries.

Table 12

Freight Rates on Domestic and Imported Baler Twine

<u>Destination</u>	<u>Aver. rate per 40 lb. bale from South-Western Ontario</u>	<u>Aver. rate per 40 lb. bale from exporting countries^(a)</u>
	¢/bale	¢/bale
Montreal	30.0	57.6
Toronto	16.0	65.5
Ft. William (Lakehead)	38.8	68.9
Vancouver	102.8	73.2
Average	46.9	66.3

(a) Tanzania/Kenya, Angola, Brazil, Mexico, Britain, Denmark, Portugal, Belgium, South Africa and Mozambique

To the Canadian manufacturer, the freight rates on twine from his plant and from the exporting country do not present the full impact of transportation costs on his competitive position. As noted above, he is faced with the cost of transporting the fibre from, in some cases, the same countries from which the competitive twines are being shipped. While information on transportation cost for fibre is not available in enough detail to permit precise comparisons, it appears that the transportation cost on the fibre is often as great as, or greater than, that noted in table 12 for baler twine coming from exporting countries; for example, rates equivalent to 72 cents a bale were reported to the Board for sisal shipped to Hamilton or Toronto from East Africa.

In some instances, the Canadian manufacturer of harvest twine might gain an advantage because of the cost of inland transportation to the customer from the plant, compared with that from the port of entry of the imported twine. However, the differential in the inland rates does not always work to the advantage of the Canadian manufacturer and, particularly in Western Canada, the Atlantic provinces and the regions around Montreal and Quebec City, it will generally work to his disadvantage. Moreover, some customers find it convenient to pick up their twine in Montreal, Toronto or some other port of entry, with the result that there is no inland freight cost to the supplier, except in the form of whatever discount he allows for customer pick up.

Some advantage might be gained by the Canadian twine manufacturer by closer proximity to the market which permits the company to provide shorter delivery times and other services to the market and to follow market conditions more closely. However, taking all factors associated with the transportation of harvest twines and the fibres into account, it is evident that the Canadian harvest twine industry gains no appreciable overall advantage from this factor and will experience a disadvantage in some regions of Canada and the U.S.A., particularly with respect to some of the newer twine manufacturers in fibre-growing countries.

Summary of the Competitive Position

The above considerations, when considered together, do not seem to indicate any factors in the present situation which offer advantages of substantial degree to the Canadian industry. The world supply and demand for the fibres and the twines are in a distressed position but improvement in the world situation will not necessarily favour, to any great extent, the position of the Canadian industry. Some combination of circumstances might enable the industry to continue to operate, more or less as it has done over the past decade, without investing more in the production of harvest twines or balings from natural fibres. Other circumstances might induce the industry to invest in equipment to produce harvest twines or balings on a commercial scale from synthetic resins.

In summarizing the industry's position, the harvest twine manufacturers cited four factors as being especially important in placing them at a disadvantage in competing against the imported twine countries. These were: the differential in labour costs and overhead costs, the need to provide services to the farmer and the discriminatory nature of freight rates for the transportation of twine and fibres. These factors, which have been touched upon above, are dealt with also in the later section on Representations.

THE COST OF TWINE TO THE FARMERS

While it is difficult to get precise information on the cost of harvest twine to farmers and the relative magnitude of this cost in the operations in which harvest twines are used, the available information indicates that these twines are not a major element of farm costs. Moreover, because the cost of twine is itself fairly small compared with the value of the products on which it is used, an even smaller impact could be expected from any difference in costs of twine to farmers which might result if they were required to use a larger proportion of twines produced in Canada. Even so, the availability of harvest twines from many sources of supply, and the keen price competition that has resulted, undoubtedly has reduced farmers' costs to some extent, within the range of the magnitudes suggested by the following cost comparisons.

The Cordage Institute of Canada estimated the cost of baler twine on the average as 2 per cent of the value of the product (hay and straw) baled.

Explaining the method of calculation of these estimates, a spokesman for the Cordage Institute of Canada stated:

"... we established through inquiry in the regions of Canada as set forth in your questionnaire the Atlantic region, Quebec, Ontario, Western Canada, the selling prices to the consumer for baler twine. We have also ascertained the price per ton of hay. We have then weighted both of these figures with respect to the amount of hay production in the various areas and we developed an average retail price per ton of hay of \$22.03 a ton across the country. This figure is substantiated by official statistics. The average retail price of baler twine was \$7.01. Then, by arithmetic we have a ton of hay valued at \$22.03 and we can bale 17 of those tons of hay with a bale of twine costing \$7.01 and the percentage of cost there is approximately 2 per cent." (Vol. 1, p. 114)

In terms simply of the cost of the baling operation, itself, the Saskatchewan Department of Agriculture estimated that the baler twine represented 20 per cent of the total cost of the baling operation and amounted to about 1.5 to 2.0 cents a bale of hay or straw.

In speaking of the total costs of the baler twine to the farmer, the Farmers' Union of Alberta, assuming one ton of hay to be produced per acre in Western Canada, 2.7 pounds of baler twine per ton of baled hay, and a value of baler twine at the farm level of 20 cents per pound, estimated that, on average \$72 worth of baler twine was used in 1966 for each farm having a baler machine, for a total cost of about \$4.7 million for the four western provinces. (Vol. 5, p. 918). For binder twine, the Farmers' Union estimated the cost to be within the range of \$100,000 to \$200,000 for the western provinces.

While not making a specific, independent estimate, a spokesman for the Canadian Federation of Agriculture was in general agreement that the cost of baler twine was about 2.7 per cent of the value of a ton of hay baled, based on a price of baler twine of \$6.50 to \$6.70 per package of 40 pounds, 10,000 feet, and an average value per ton of tame hay of \$18.02.

With respect to the cost of binder twine per bushel of grain, the Canadian Federation of Agriculture, in a letter to the Board, made the following calculation:

"The local prices (Ottawa) for binder twine are \$11.40 to \$11.60 per six ball package, with each ball weighing eight pounds and containing 4,800 feet of twine. Thus, the package weighs 50 pounds (48 lb. twine + 2 lb. wrapping) and contains 28,800 feet of twine. This amount of twine will tie approximately 14,400 to 9,600 sheaves of grain (24-36 inches per sheaf). Thus the cost per sheaf is $\$11.50 \div 12,000 \text{ sheaves} = 0.10 \text{ cents}$. Since there are approximately 10 to 20 sheaves per bushel of grain the cost of twine per bushel of grain is in the range of one to two cents."

The prices per bushel, to the farmer, for various grains in 1966-67 were given as: wheat \$1.68, oats \$0.73, barley \$1.03, rye \$1.05, and mixed grains \$0.88.

The consensus of opinion at the public hearing was that the estimates made by the Canadian Federation of Agriculture and the Cordage Institute of Canada of the ratio of cost of twine to the value of a ton of baled hay were essentially correct.

REPRESENTATIONS

This Reference, unlike most of those which come before the Board, did not request specific recommendations regarding the Customs Tariff. The parties, therefore, for the most part, simply explained how the current situation was affecting their interests, and what they foresaw in the future.

Altogether, more than two dozen submissions were presented and some of these dealt with the interests of a large number of affiliated or associated organizations. Taken together, these expressions of interest appeared to represent very broadly the positions of the domestic twine manufacturers, the Canadian farmers who are the users of twine, the importers, and the producers of twine in other countries.

The principal expression of concern over the present situation was made by the four manufacturers of harvest twine in Canada, who made representation through the Cordage Institute of Canada. Spokesmen for Brantford Cordage, Doon Twines, International Harvester and Plymouth Cordage, the four manufacturers, were present to inform the Board on their individual interests.

The Canadian harvest twine industry made three principal contentions: that imports of twine are causing injury to the Canadian industry, that twine manufacturers in some other countries have advantages in competition, some of which reflect government assistance in those countries, and that the need for some corrective or remedial action in Canada is urgent. The position of the manufacturers was supported by two unions, the United Automobile-Aerospace and Agricultural Implement Workers of America and the United Steelworkers of America, which represent most of the production workers in the industry.

Farm organizations in Canada took the position generally that the present duty-free, unimpeded entry of harvest twine should be continued in the interests of the farmers.

The representatives of foreign suppliers urged that foreign sources of supply offer advantages to Canadian farmers; some urged also that their exports of twines are important to the economies of the developing countries and to their balance of trade with Canada.

The Canadian twine industry, consisting of the aforementioned four companies, summarized their position, in part, as follows:

"The Canadian harvest twine industry is suffering serious injury through imports and a continuance of this condition is certain, unless wages and other costs in producing harvest twines in foreign countries come more in line with those in Canada, which is most unlikely, or unless some remedial action is taken. The whole cordage and twine industry in Canada is threatened, because of the importance of the harvest twine component. Two Canadian companies have expressed their intention in the absence of a more favourable business climate, to abandon harvest

twine production. A third Canadian company is examining the possibility of transferring its manufacturing operation, including machinery, to a foreign country.

"... The need for corrective action is urgent if Canada is to have a viable harvest twine industry."
(Vol. 1, p. 29, 30)

The Canadian manufacturers supported their position by drawing attention to the substantial increases in imports and the price declines for harvest twines which have already been outlined. They submitted information on wage rates in Canada and in some of the other producing countries to emphasize the disadvantage of the Canadian industry in respect of labour costs. They noted, too, that overhead costs contain a high salary and wage component and are relatively higher in Canada on this account. They also suggested that even though output per worker in Canada is higher than anywhere else in the world, this did not convey any significant advantage; modern techniques of production are being used everywhere and differences in productivity are not great enough to offset the higher wage rates in Canada. This contention was challenged by the spokesman for manufacturers in Portugal who stated that the number of workers per plant in the Portuguese industry was much higher than in Canada.

The submission by the Canadian industry stated that average wages paid in Canada for hourly rated employees in the manufacture of harvest twines was in excess of \$2.20 per hour, supplemented by fringe benefits valued at 48 cents per hour. The wage rates alone, it was claimed, were more than twice those paid in Britain, nearly six times the rates in Portugal and Mexico, and more than fifteen times the rates in Africa and Brazil. The industry contended that, in addition, higher rates of pay increased overhead costs in Canada relative to these other countries.

Spokesmen for some of the exporting and importing interests challenged the conclusion by asserting that higher rates of pay in Canada were offset by a productivity substantially higher than in the newer producing countries. The Canadian industry was said to produce about 115 pounds of twine per man-hour whereas, a spokesman for the manufacturers in Portugal stated, output per worker in Portugal was only one-third as high. This contention, in turn, was disputed by the Canadian producers. No satisfactory evidence was submitted to permit an accurate appraisal. However, even this differential in output per worker would appear to offset only about one-half of the difference in relative labour cost, suggested by the above comparison.

A spokesman for the two trade unions supported the twine manufacturers in seeking remedial action and made the following comments on labour costs:

"... wage rates are not necessarily labour costs. These are two entirely different things ... direct labour costs in terms of the selling costs of the products involved in this case is by a very rough estimate that we have made probably not any higher than about 10 per cent. There are many, many Canadian industries with significantly higher wage levels than in foreign countries, yet labour costs and

total costs are significantly lower. I am not saying that this is the case here. I am just making several points regarding the effect of wage rates on labour costs."

(Vol. 2, p. 299)

The position of the trade unions more generally was that the unions were committed to a policy of freer trade as being in the long-term interests of Canada and its workers. It was recognized that the policy would sometimes require dislocations but that Canada's trading partners have an obligation to pursue policies to avoid sudden and serious disruption of a Canadian industry. In this instance, given the very rapid rise in Canada's imports, such policies in the opinion of the two unions, might call for voluntary export restraints by some of the countries shipping twine to Canada.

With respect to the sales and service costs of the Canadian industry, the manufacturers stated that they were at a disadvantage because they gave more service and provided it to purchasers of small quantities as well as to the large dealers and distributors. One statement made by the manufacturers on this disadvantage was as follows:

"The sales and distribution expenses of the harvest twine manufacturers vary greatly as between selling to the major customers, and selling to the smaller customers. Sales expenses would obviously be greatly reduced if sales were made only to the major customers. It would, however, not be satisfactory from the viewpoint of those Canadian farmers whose needs would be left unfulfilled, if our sales organizations ignored their needs merely because the costs of selling to them were high."

(Vol. 1, p. 14, 15)

It is, of course, difficult to assess the impact of any difference in selling practices. The provision of services, at some extra cost, is a cost which the manufacturers assume, at least in part, as a means to attract customers to their product. Any increase in cost must, therefore, be assessed against the benefit accruing to the manufacturers as a result of making the service available. Moreover, even though a dealer might purchase imported twine at a lower unit cost, he, or someone further along in the distributing system, presumably is called upon to provide any of these services which are a necessary feature of selling twine. The retail price to the farmer would then reflect the cost of the service.

The Canadian manufacturers also noted that transportation costs conveyed no advantage to the Canadian industry because their fibre raw material was imported at freight rates comparable to those on the finished twine. Twine manufacturers in western Europe, because they also imported fibre, were also at a disadvantage compared with twine manufacturers in the fibre-producing countries; the western European companies were, in large part, said to be experiencing the same difficulties as the manufacturers in Canada.

The spokesmen for the industry in Britain, Denmark and Belgium urged that imports from those countries were not the cause of the difficulties of the Canadian companies and that they, too, had difficulty in meeting the competitive situation of the past few years.

In regard to the subsidization or other government assistance given to the industry in other countries, the submission of the Cordage Institute stated:

"Other conditions which work against Canadian manufacturers are in the forms of subsidization and other governmental assistance in foreign countries whose harvest twine manufacturers compete in our market. For example, in Tanzania, the harvest twine manufacturers are exempted from payment of a tax on raw material produced within that country which is paid by purchasers in other countries. As another example, when the Cuban Government nationalized all sisal plantations and twine mills in Cuba, no compensation was paid to the owners of either the plantations or mills. The Cuban Government therefore has a free investment in these properties giving them a tremendous advantage in production costs. (Vol. 1, p. 16, 17)

The Board did not investigate these circumstances or this impact on Canadian industry. To do so would have required a very extensive study of conditions in many countries. By and large, spokesmen for producers in other countries denied the existence of such assistance, or that it had any material effect.

Some of the exporting countries refuted this allegation categorically. The submission of the Government of Tanzania stated, "The Government of Tanzania does not subsidize these exports in any manner." (Vol. 4, p. 711). The submission of Cordemex stated:

"This corporation is owned by an agency of the Mexican Federal Government. It does not receive subsidies or grants from any governmental agency, and operates as an independent commercial enterprise, through its own resources. The corporation controls production and distribution of virtually all industrial plants producing binder and twine for baling farm produce exported from Mexico." (Vol. 3, p. 464)

Similar denials were made by other interested parties as well.

The Canadian manufacturers of twine were naturally concerned with the size of margin that exists between the cost of the fibre which they use to make twines and the selling price of the twines. Because the cost of fibre is so large a part of total costs, this margin expresses clearly how they must control other costs of production and distribution if they are to remain in operation. As a general rule, the manufacturers took the view that a situation of over-supply of fibres tended to narrow the margin between sisal costs and twine prices, as twine manufacturers in general tried to make and dispose of larger quantities. A position of short supply for the fibres, on the other hand, tended to result in a short supply of twine with some tendency for the margin to widen and for twine manufacture to be more profitable, providing companies could avoid serious losses on fibre and twine inventories when conditions of supply eased again. This matter has been dealt with in the earlier sections of the report where it was noted that the margin had narrowed appreciably in recent years although, in 1968, it was still somewhat higher than in the late 1950's and early 1960's.

The manufacturers, however, expressed considerable anxiety that the margin had been reduced below the amount at which they could sustain operations, and they expressed concern that the situation showed every sign of continuing.

Even if some widening of the margin might follow from an increase in the price of twine, the industry, as noted earlier, would be confronted with another problem: the possible entry into the harvest twine market, on a substantial scale, of twines or balings made from polypropylene or other synthetic fibres. This entry might favour the present four manufacturers of harvest twines in Canada, or it might simply introduce new competition from other sources. Hence, the manufacturers regarded their situation as particularly difficult and in need of some kind of remedial action.

The farm organizations, importers and representatives of producers in other countries in general favoured the existing policy of unimpeded, duty-free entry of harvest twines into Canada. With appropriate differences in emphasis from one group to another, these interests would resist restraints principally for three reasons: import restrictions would tend to raise costs to the farmers; they would have unfavourable effects on the economies of other countries, especially those countries attempting to develop some industrial base; and, a closely related concern, restraints would tend to make even larger the deficit in trade which these countries have with Canada.

Eight agricultural organizations participated directly in the submissions which were made before the Board; they represented indirectly a much larger number of farm organizations. The eight were: The Canadian Federation of Agriculture, Interprovincial Co-operatives Limited, United Grain Growers and United Farmers of Alberta Co-operative, in a joint submission; National Farmers Union; Farmers' Union of Alberta; the Saskatchewan Department of Agriculture, and le Ministère de l'Agriculture et de la Colonisation, Québec.

The agricultural co-operatives estimated that their associations are responsible for the purchase and sale of perhaps one-third of all of the baler and binder twine used by farmers in Canada. In 1967, their total sales of these products amounted to 650,000 bales, at a purchase price to the co-operatives of \$4 million. The co-operative associations do not manufacture twine; in their purchases of twine, they stated that they found little or no difference in quality and performance between imported and domestically produced twine, though the price of the imported twine tended to be lower than that of domestically produced twine. This advantage may be somewhat offset by the longer lead time required to obtain supplies from abroad and some consequential additional uncertainty of the final landed cost. The submission on behalf of the co-operatives stated:

"We would firmly oppose protective action to limit or restrain imports, thus increasing the cost to the producer ... if it can be at all avoided no action should be taken which would jeopardize the ability of producers of these fibres, who are located in countries badly needing the business, to maintain and increase their exports ... the same sympathetic argument may be deduced with respect to the opportunities offered to many of the less developed exporting countries to maintain their twine manufacturing industries."

(Vol. 5, p. 877-8)

In the course of the discussion on costs to the farmer, while noting the difficulties of precise calculation, spokesmen for some of the agricultural organizations were in agreement that twine costs typically would not be much in excess of two per cent of the selling value of the farm produce on which it was generally used. An example was cited of a cost for twine of perhaps 48 cents to bale a ton of hay valued at \$18 or more. The National Farmers' Union stated that any additional twine costs would tend to be borne by the farmer who, by this submission, has no way of passing on the costs; any increase in costs to the farmer "would be clearly unwelcome". The Farmers' Union of Alberta also noted that the farmers are in a steadily worsening cost-price squeeze and that "any action to prevent further deterioration of their financial position will be greatly appreciated". (Vol. 5, p. 914).

The farmer co-operatives, through Interprovincial Co-operatives Limited, purchase directly from foreign sources of supply and, to this extent, might be said to represent views similar to those of importers as well as to those of farmers who are the final users of twine.

Nineteen other parties made representations to the Board, either as importers or as the representatives of manufacturers of twine in other countries. These interests have been enumerated in the Lists of Representations earlier in this Report, fourteen as foreign producers and five as Canadian importers. Five of the producers' submissions were on behalf of companies located in Portugal and two were on behalf of companies in Belgium; the others, individually, were for producers located in: Angola, Britain, Denmark, Mexico, Mozambique, the Netherlands and Tanzania. One of the importers, National Cordage Limited, which claimed to be the leading importer of twine, expressed the opinion that it was the sole importer of twines from the manufacturers in Portugal and, possibly, from those in Angola and Mozambique.

These submissions were in general agreement with the position of the agricultural interests noted above. The importers tended to emphasize the possible increase in farm costs that might result from restraints on imports, and also Canada's international trade policy and commitments which would tend to the avoidance of restrictions to trade, particularly in products destined for agricultural use. Some importers questioned whether the manufacturers in Canada needed to have restrictions placed upon imports, and drew attention to the importance of the decline in the industry's exports to the U.S.A. as a contributing factor in its worsening fortunes -- a factor which would not be directly affected by restrictions on imports into Canada. Some of the importers also stressed the fact that substantial quantities of the imports from Mexico were made by one of the Canadian manufacturers of twine.

The manufacturers of twine in other countries expressed grave concern about the possibility of restrictions on imports into Canada, and some noted that Brantford Cordage had argued very cogently some years ago against the principle of restrictions before the United States Tariff Commission.

The exporters in western Europe noted that they were experiencing generally the same difficulties in competing against the newer manufacturers in other countries as were the manufacturers in Canada, that they were not creating the downward pressure on prices, and that restrictions on their exports to Canada would be unwarranted and injurious to them. The submission by J.E. Derenne Limited, representing a group of Belgian manufacturers, stated, for example:

"... it happens year after year that we are unable to meet the conditions offered by the Canadian manufacturers of baler twine.

"On the basis of large rebates for freight costs given to customers, the Canadian twine is generally sold at a net price considerably lower than the official rates. Every season we are losing orders because we could not meet those net prices ... Concerning the imports from other countries we might say that ... we suffer mostly from large sales of twine imported from Mexico by the largest Canadian manufacturer of baler and binder twine." (Vol. 4, p. 631-2)

The submission by The Cordage Manufacturers Export Group of the United Kingdom noted that harvest twine from that country was handled through the usual, recognized channels of trade and distribution and, in the matter of pricing, compared with that of the Canadian manufacturers. The spokesman noted that "we find we can compete fairly and equitably". (Vol. 4, p. 655).

The manufacturers in Mexico, Portugal and the east African countries noted the importance of these exports to the economies of their countries and the resulting injury to these economies if the exports were cut off or substantially reduced. Almost the entire production of twine in these countries is exported; Canada and the U.S.A. are the principal markets. It was stated for example by Cordemex, the sole exporting company in Mexico, that about 95 per cent of the production of harvest twines in that country is sold in the U.S.A. and Canada.

The exporting countries generally drew attention to Canada's export balance of trade and noted that any restrictions on imports of twine into Canada would tend to worsen the trade balance for the twine exporters.

The submission of the Companhia De Fiacao E Cordoaria De Angola, S.A.R.L. summed up the position of the developing countries:

"There is almost no secondary industry in Angola and we and our local authorities would be most disappointed if the Canadian Government should eventually take action to restrict our exports to Canada to the detriment of our already struggling economy.

"In closing, let us say, that the economy of Angola is rather poorly developed, but nevertheless slowly developing and it hardly seems fair that one of the few Angolan products that it is possible to export to Canada should be singled out for any restrictive measures." (Vol. 4, p. 753)

Thus, the exporting countries in general took the position that protection, in whatever form, could have a disproportionately large impact on the economies of other countries while, at the same time, tending to increase costs for the farmers in Canada.

SUMMARY

This Reference is concerned primarily with binder twine and baler twine made from natural fibres of either sisal or henequen. Binder twine is used in grain binders in the harvesting of cereal crops and to some extent in rotary-type balers; baler twine is used in mechanical pick-up balers in the harvesting of fodder, principally hay, and in the baling of straw.

In this summary the words "harvest balings" will be used to refer to all the various types of ties or bindings used for agricultural purposes, with the exception of wire; thus harvest balings will include any cordage, twine, tape and other tying agents whether made from natural fibres or synthetic materials. The words "harvest twine" will be used to refer only to binder twines and baler twines made from natural fibres.

In addition to baler twine, the words "twine for baling farm produce" in tariff item 40922-1 include other agricultural twines such as those used in tying or baling tobacco, Christmas trees, and fresh vegetables; however, these other uses represent a small part of the use of harvest twine. There is some production of harvest balings made from synthetic materials but as yet such balings have had little impact on the natural hard-fibre harvest twines. However, this situation may well change; accordingly this report also reviews the progress and prospects in the production of harvest balings made from synthetic materials as well.

Over the years, one of the problems encountered by Canadian producers of twine has been the great variability of prices. The output of natural fibres is relatively insensitive, in the short run, to price changes: the plants require several years to mature and once they have reached maturity they yield fibre for several years. The amount of twine used is also insensitive to price changes: the twines form a small part of the cost and price of the products for which they are used and they are essential for present-day harvesting operations. Accordingly, small changes in world fibre production or in the amount of twine required may occasion relatively large changes in the prices of both fibre and twine. For example, the average list price of baler twine to dealers in Canada increased from \$8.80 per 40-pound unit in 1947 to \$16.80 in 1952; it fell to \$7.35 in 1962 and rose again to \$10.80 in 1964; in 1968 it was \$6.85. The prices of binder twine experienced somewhat similar fluctuations. Meanwhile, the prices of imported sisal fibre had risen from \$3.41 for 40 pounds in 1946 to \$9.03 in 1951; it had fallen to \$3.01 in 1958 but had risen to \$6.92 in 1964. In 1967 it was \$3.22 and in October, 1968, it was \$3.02.

These fluctuations in price occurred in spite of the fact that, in the last few years, studies and negotiations had been undertaken by a committee of the Food and Agriculture Organization of the United Nations which resulted in the adoption of an indicated price range for sisal fibres as well as quotas applicable to the exports from the fibre-producing countries of sisal fibre and sisal manufactures taken together.

In time, the prices of both the fibre and the twines may increase from their present low levels; however, for competitive reasons mentioned later, it appears unlikely that they will return to a more permanent relationship favourable to Canadian twine producers.

In the future, moreover, the existence of balings of synthetic materials may set an upper limit to the prices of twines made from natural fibres and influence the prices of the fibres themselves.

Prior to the Second World War the principal product of the harvest twine industry was binder twine. Two decades ago shipments of harvest twines by the Canadian industry consisted of more than 90 per cent binder twine and less than 10 per cent baler twine; today these figures are reversed; binder twine accounts for about 10 per cent of shipments whereas baler twine accounts for 90 per cent. Most of this change took place during the 1950's; by 1960, for example, the production of binder twine had fallen to 22 per cent of the total and baler twine had increased to 78 per cent. This change from binder twine to baler twine was the significant development in the harvest twine industry during the 1950's. The change to a somewhat heavier and stronger twine involved relatively minor changes in the manufacturing process. The Canadian industry adjusted to this development without any noticeable change in the structure of the industry.

However, during the 1960's, the industry in Canada and, indeed, in all the more highly industrialized countries, has been faced with a development of an entirely different nature. This development has been the emergence in several of the less highly industrialized countries, including some that produce the fibres, of substantial manufacture of harvest twines. Since the manufacturing processes are relatively simple and little skilled labour is required, these products can readily be produced in the developing countries, especially in those which also produce the fibres.

The following figures illustrate the extent of this development: imports of harvest twines into Canada and the United States from Portugal totalled about 16 million pounds in 1960 but were 60 million pounds in 1967; imports from Brazil were negligible in 1960 but were over 17 million pounds in 1967; there were no recorded imports from Angola, Kenya, Mozambique and Tanzania until 1965, but by 1967 imports from these four countries had reached about 35 million pounds.

The entry of these new countries into the harvest twine industry has affected the producers in virtually all the older producing countries. In the United States some years ago there were seven or eight commercial producers of harvest twine whereas today there is only one; in Belgium, the number of producers dropped from seven or eight to two and in the United Kingdom, from ten to three. No comparable adjustment has yet taken place in Canada; in fact one of the four present producers only commenced the production of harvest twines during the 1950's although it produced other cordage prior to that time; one other company did produce baler twine in the years 1959 to 1962.

Canada and the United States are the principal users of harvest twines, at least in the non-communist world. For years, the Canadian producers have made substantial exports of harvest twine to the United States and until 1960 total Canadian shipments, including domestic sales and exports, exceeded Canadian consumption by a substantial margin each year; however, since 1960 in only two years has this been the case. Canadian consumption of harvest twines has been increasing; the annual average for the three years, 1965, 1966, and 1967, exceeded that for the period, 1955, 1956, and 1957, by about 28 million pounds. The average annual imports increased by almost the same amount between the same two periods; thus the increase in Canadian consumption was almost completely filled by imports. Canadian exports to the United States are now falling; they reached a peak of 35 to 40 million pounds in 1965 and 1966, but by 1967 they had dropped to about 25 million pounds and, in 1968, they were only 18 million pounds.

The share of the Canadian market filled by imports in the last four or five years has almost doubled; in 1963, imports accounted for about 30 per cent of Canadian domestic consumption and by 1967, imports accounted for almost 60 per cent of the Canadian domestic market. At the same time, as noted above, competition in the United States market from the new producers had a significant unfavourable effect on Canadian exports to that market.

Because of the increase in imports and the decline in exports, shipments of harvest twines from Canadian producers in 1967 were almost the same in quantity as they had been in 1957 and 1958; but were 25% lower than at the peak in 1963; in 1968 they were still lower.

In two important respects the new producers have significant advantages over the Canadian producers: lower wage rates and easier access to fibre.

The more important of the two is lower wage rates; in some of the sisal producing countries wage rates were stated to be about 6 per cent of Canadian wage rates and in Portugal and Mexico, something less than 20 per cent. To some extent these differentials appear to be offset by greater output per man hour in Canada; however, considering that the same basic machinery, purchased principally from the same manufacturer, is used by all producers and that the nature of the manufacturing processes is such that little skilled labour is required, any advantage in productivity which the Canadian producers may now enjoy may be expected to diminish. Thus, while wage costs per bale of twine may decrease in the newer producing countries, in Canada they are more likely to increase.

The other advantage of the new producers is their access to the fibres; the fibres are either grown in the twine-producing country or in its associated territories. It was suggested at the hearing that, in some areas, the foreign twine producers have access to fibres at a lower price than do Canadian producers, but this was not substantiated. In any event, the purchasing, transportation and other costs involved in importing fibres and fabricating twine in Canada as compared with the costs involved in purchasing fibres locally and exporting twine to the North American market would suggest that the manufacturers in the fibre-producing countries generally have, and will continue to have, a cost advantage.

It seems unlikely, therefore, that the production of harvest twines by the Canadian industry, in its present form, can long survive the entry of these new producing countries into the world market.

Mention was made earlier of the advent of harvest balings made from synthetic materials. While these products have not yet secured a significant share of the market, nevertheless, they must be reckoned with in any consideration of the future of the harvest twine industry. Apparently, the change from the use of natural-fibre baler twines to the use of balings of synthetic materials requires some adjustments to the farm machinery; this is not an insuperable obstacle as is illustrated by the increasing use of synthetic materials in other countries and, to some extent, in the Prairie Provinces. The synthetic material most commonly used is polypropylene and its cost is still such that the use of natural fibres is more economical. However, this situation may well be changed either by a reduction in the cost of polypropylene, as has happened in the case of many synthetic materials as they became more popular, or by an increase in the price of natural fibres which is said to be now abnormally low, or by a combination of the two. When the production of harvest balings made from synthetic materials becomes competitive with the production of harvest twines from natural fibres, Canadian producers, by the production of synthetic balings, may well capture a substantial portion of the market which has been taken over by imports of natural-fibre twines. However, this development may be some time away and the present Canadian producers of natural-fibre twines may not be the producers of the harvest balings of synthetic materials. To some extent the outcome will depend on the ability of the present harvest twine producers to maintain their distribution facilities during the transitional period.

Harvest twines represent widely varying proportions of the total sales volume of the four producers in Canada. During the last four or five years this percentage has been decreasing for each of the four companies; a complete loss of the harvest twine business, while it would be serious for some of them, would not appear to be fatal to any one of them. There are not a great many people employed in the production of harvest twines; for example, in 1968 there appear to have been less than four hundred hourly rated employees; however, as mentioned earlier, to a large extent they are unskilled employees and if the production of harvest twines ceased some might have difficulty in finding other employment.

It is not possible accurately to segregate, from the producers' financial statements, the profit or loss on harvest twines alone. However, from the information available, the Board has concluded that the production of harvest twines has been less profitable in the last two years than it was in the immediately preceding years. The companies, taken together, reported a loss on their harvest twine operations in 1968.

The future of the production of hard-fibre harvest twines in Canada appears therefore to be uncertain. A spokesman for the Cordage Institute, referring to the existing conditions throughout the industry, stated his opinion that even one Canadian producer would have difficulty surviving and there are four such producers. On the

one hand the competition from the fibre-producing countries and Portugal will probably continue to be a serious factor in both the Canadian and the United States markets for harvest twines. On the other hand should conditions alter so that synthetic materials supply a larger portion of the harvest balings market, the present Canadian producers of hard-fibre twines may find themselves faced with an entirely different array of competitors, both in Canada and elsewhere.

The letter of reference indicates that the Government wishes to have information on the relative importance of harvest twines as a cost element in the different segments of Canadian agriculture in which they are used. In its submission to the Board, the Cordage Institute of Canada, representing the Canadian harvest twine producers, presented figures to show that the cost of baler twine represents, on the average, something in the order of two per cent of the value of baled hay and straw. The Canadian Federation of Agriculture, in response to the Board's request, also submitted information on this point. Baler twine, the Federation indicated, represents between two and three per cent of the value of baled hay. Binder twine is used in harvesting a number of different cereal crops and the cost represented by the binder twine varies considerably as between one crop and another; from the information submitted by the Federation, the cost of binder twine would seem to be between one and two per cent of the value of the grain produced. However, the use of binders and binder twine is now very limited, and is decreasing.

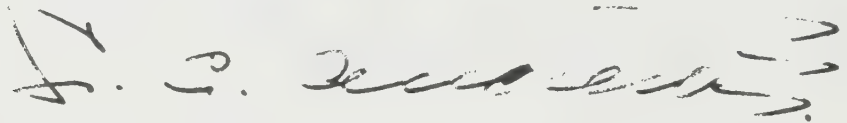
There are a number of factors which affect the relative importance of the cost of these twines; in the case of baler twine it varies with the weight of the hay and straw, with the size of the bale at which the farmer has set his baler, and with the value of the crop which may vary considerably from year to year. In respect to binder twine, as mentioned above, the percentage of cost varies from crop to crop, for example, wheat may sell at twice the price of oats. It also varies with the crop conditions: obviously it takes fewer sheaves with full heads of grain to produce a bushel than with heads which are not as full. The price of twine, of course, has a direct effect on its relative importance as an element of cost. To illustrate in absolute terms the cost of twine to the user, the domestic consumption of baler twine in 1967 was approximately two million bales or eighty million pounds, which at list price cost the agricultural community \$15.7 million; the same quantity at 1968 prices would have cost \$13.6 million; at 1964 prices the cost would have been \$21.5 million and at 1952 prices, \$33.5 million.

From the information before the Board it would seem that the cost of these twines may represent as little as something less than one per cent in some cases, and in other cases, as much as something over two per cent of the value of the product.

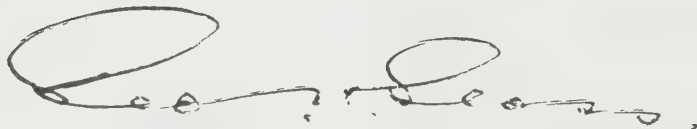
APPENDED OBSERVATION

Though somewhat peripheral to this report, it may be useful to note that, in the course of the public hearings on this Reference and on Appeal 863, it was brought to the Board's attention that there are certain goods used in the tying or baling of farm produce which, because they are not considered to be "wire" or "twine", are not classified under tariff item 40922-1; therefore, materials entering into the cost of manufacture of such goods are not entitled to entry under tariff item 44200-1 which provides entry free of duty.

The result is that materials used in the manufacture of such goods are dutiable whereas, to the extent that such goods are used for tying or baling farm produce, they are competing with "twines" made from materials which may be imported free of duty.



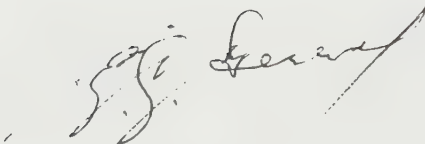
Chairman



First Vice-Chairman



Member



Member



Member

Ottawa, March 21st, 1969

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Table 1

Shipments of Binder Twine and Baler Twine, Canada
1949 to 1968

Year	Binder Twine			Baler Twine			Total Binder and Baler Twine		
	Quantity lb. (000)	Value \$ (000)	Unit Value \$/lb.	Quantity lb. (000)	Value \$ (000)	Unit Value \$/lb.	Quantity lb. (000)	Value \$ (000)	Unit Value \$/lb.
1949	47,931	7,543	.16	3,123	675	.22	51,054	8,218	.16
1950	39,127	6,468	.17	7,523	1,599	.21	46,650	8,067	.17
1951	65,934	13,710	.21	16,232	4,232	.26	82,166	17,943	.22
1952	55,097	12,209	.22	23,190	6,974	.30	78,286	19,184	.25
1953	33,896	5,620	.17	22,823	3,864	.17	56,720	9,484	.17
1954	30,799	4,159	.14	20,963	3,379	.16	51,762	7,538	.15
1955	27,350	3,573	.13	30,693	3,829	.12	58,042	7,402	.13
1956	21,947	3,438	.16	39,262	5,305	.14	61,209	8,744	.14
1957	19,956	2,794	.14	41,452	5,702	.14	61,408	8,496	.14
1958	17,810	2,389	.13	42,685	5,755	.13	60,495	8,144	.13
1959	14,588	1,949	.13	44,923	6,195	.14	59,511	8,144	.14
1960	12,727	1,962	.15	43,241	6,412	.15	55,969	8,374	.15
1961	9,531	1,540	.16	45,212	7,068	.16	54,743	8,609	.16
1962	11,198	1,710	.15	59,529	8,865	.15	70,727	10,575	.15
1963	11,638	1,938	.17	70,185	12,269	.17	81,823	14,207	.17
1964	10,030	2,152	.21	61,019	13,070	.21	71,049	15,222	.21
1965	10,471	2,117	.20	63,254	12,357	.20	73,725	14,474	.20
1966	8,722	1,499	.17	67,478	10,970	.16	76,200	12,469	.16
1967(a)	6,517(p)	1,083(p)	.17	53,646(p)	8,495(p)	.16	60,163(p)	9,578(p)	.16
1968	4,431	696	.16	43,569	6,096	.14	48,000	6,792	.14

(a) Shipments data from Tariff Board questionnaire
(p) Preliminary

Source: D.B.S., Cat. No. 34-203

Table 2

Supply and Disappearance of Harvest Twines, 1955-1968

- Quantity -

	Binder Twine				Baler Twine				Total Harvest Twines			
	Cdn. Ship-ments lb. (000)	Net (a)		Apparent Consumption lb. (000)	Cdn. Ship-ments lb. (000)	Net (a)		Apparent Consumption lb. (000)	Cdn. Ship-ments lb. (000)	Net (a)		Apparent Consumption lb. (000)
		Imports	Exports			Imports	Exports			Imports	Exports	
		lb. (000)	lb. (000)			lb. (000)	lb. (000)			lb. (000)	lb. (000)	
1955	27,350	4,110	9,415	22,044	30,693	5,847	17,674 ^(b)	18,866	58,042	9,957	27,090	40,910
1956	21,947	5,095	7,445	19,598	39,262	7,551	19,658 ^(b)	27,154	61,209	12,646	27,103	46,753
1957	19,956	3,049	5,647	17,358	41,452	11,165	17,605 ^(b)	35,011	61,408	14,214	23,253	52,369
1958	17,810	2,930	5,501	15,239	42,685	11,644	20,668 ^(b)	33,662	60,495	14,574	26,169	48,900
1959	14,588	4,798	4,301	15,085	44,923	16,333	19,312 ^(b)	41,943	59,511	21,131	23,614	57,028
1960	12,727	3,568	2,607	13,688	43,241	19,682	17,337	45,586	55,969	23,249	19,944	59,274
1961	9,531	4,506	2,242	11,795	45,212	29,354	18,887	55,680	54,743	33,860	21,129	67,475
1962	11,198	2,234	2,447	10,985	59,529	22,553	21,929	60,153	70,727	24,786	24,376	71,137
1963	11,638	1,552	2,870	10,320	70,185	22,149	27,609	64,725	81,823	23,701	30,479	75,045
1964	10,030	1,682	3,033	8,679	61,019	31,332	23,284	69,066	71,049	33,013	26,317	77,745
1965	10,471	1,178	2,630	9,019	63,254	30,303	40,737	52,820	73,725	31,481	43,367	61,839
1966	8,722	996	2,935	6,782	67,478 ^(p)	39,139	35,641	70,976	76,200 ^(p)	40,135	38,576	77,759
1967	6,517	1,422	1,489	6,451	53,646 ^(p)	49,806	23,591	79,862	60,163	51,228	25,079	86,312
1968	4,431 ^(c)	1,387	1,270	4,548	43,569 ^(c)	45,410	16,717	72,262	48,000 ^(c)	46,797	17,987	76,810

(a) Total imports less re-exports

(b) Estimated

(c) Shipments data from Tariff Board questionnaire

(p) Preliminary

Source: D.B.S., Cat. Nos. 34-203, 65-003 and 65-007

Table 3

Supply and Disappearance of Harvest Twines, 1955-1968

- Value -

	Binder Twine				Baler Twine				Total Harvest Twines			
	Cdn. Ship- ments (\$'000)	Net Imports (\$'000)	(a) Exports (\$'000)	Apparent Consumption (\$'000)	Cdn. Ship- ments (\$'000)	Net Imports (\$'000)	(a) Exports (\$'000)	Apparent Consumption (\$'000)	Cdn. Ship- ments (\$'000)	Net Imports (\$'000)	(a) Exports (\$'000)	Apparent Consumption (\$'000)
1955	3,573	528	1,389	2,712	3,829	776	2,828 ^(b)	1,777	7,402	1,304	4,216	4,489
1956	3,438	699	1,144	2,994	5,305	1,011	3,201 ^(b)	3,116	8,743	1,710	4,344	6,110
1957	2,794	415	859	2,350	5,702	1,532	2,822 ^(b)	4,411	8,496	1,947	3,681	6,761
1958	2,389	374	747	2,017	5,755	1,480	3,140 ^(b)	4,094	8,144	1,854	3,887	6,111
1959	1,949	616	586	1,978	6,195	2,058	2,898 ^(b)	5,355	8,144	2,673	3,485	7,333
1960	1,962	514	368	2,108	6,412	2,600	2,717	6,294	8,374	3,114	3,085	8,403
1961	1,540	672	342	1,871	7,068	4,350	3,147	8,272	8,609	5,023	3,488	10,143
1962	1,710	336	366	1,680	8,865	3,354	3,524	8,695	10,575	3,690	3,890	10,375
1963	1,938	268	479	1,727	12,269	3,591	5,041	10,819	14,207	3,859	5,520	12,546
1964	2,152	335	593	1,894	13,070	6,288	5,045	14,312	15,222	6,622	5,638	16,206
1965	2,117	246	453	1,910	12,357	5,350	7,787	9,920	14,474	5,596	8,240	11,830
1966	1,499 ^(p)	173	473	1,199	10,970 ^(p)	5,629	5,860	10,739	12,469 ^(p)	5,802	6,333	11,938
1967	1,083	208	236	1,055	8,495 ^(p)	6,725	3,705	11,515	9,578 ^(p)	6,933	3,941	12,570
1968	696 ^(c)	182	206	672	6,096 ^(c)	5,331	2,592	8,835	6,792 ^(c)	5,513	2,798	9,507

(a) Total imports less re-exports

(b) Estimated

(c) Shipments data from Tariff Board questionnaire

(p) Preliminary

Source: D.B.S., Cat. Nos. 34-203, 65-003 and 65-007

Table 4

Imports: Sisal and other agave fibres, including waste, s.c. 245-50^(a)

Tariff Items 54005-1, 54005-2 and 55905-1

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
	<u>1. Total</u>		
1949	382,135	6,329,069	16.56
1950	569,071	8,235,520	14.47
1951	819,576	18,502,839	22.58
1952	802,344	17,021,619	21.21
1953	456,823	5,267,841	11.53
1954	572,466	5,551,190	9.70
1955	656,262	5,823,701	8.87
1956	663,328	6,076,648	9.16
1957	756,124	5,929,070	7.84
1958	621,305	4,680,215	7.53
1959	757,758	6,231,001	8.22
1960	591,284	6,099,498	10.32
1961	626,475	6,417,389	10.24
1962	859,864	8,983,904	10.45
1963	953,950	14,406,852	15.10
1964	854,301	14,782,844	17.30
1965	867,800	9,138,274	10.53
1966	851,509	8,155,000	9.58
1967	696,824	5,612,000	8.05
1968	514,649	3,887,000	7.55
	<u>2. United Kingdom</u>		
1949	3,618	63,801	17.63
1950	4,243	67,635	15.94
1951	8,036	172,399	21.45
1952	10,612	289,818	27.31
1953	1,595	18,174	11.39
1954	2,296	23,002	10.02
1955	2,622	23,940	9.13
1956	3,402	33,159	9.75
1957	3,952	36,289	9.18
1958	3,401	32,340	9.51
1959	1,680	13,042	7.76
1960	-	-	-
1961	-	-	-
1962	-	-	-
1963	-	-	-
1964	-	-	-
1965	396	10,070	25.43
1966	7,042	90,000	12.78
1967	287	7,000	24.39
1968	345	8,000	23.19

Table 4
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>3. United States</u>			
1949	95,399	1,597,040	16.74
1950	62,388	997,752	15.99
1951	168,531	4,675,296	27.74
1952	225,239	5,496,856	24.40
1953	122,139	1,550,211	12.69
1954	92,557	1,003,195	10.84
1955	134,348	1,264,093	9.41
1956	98,403	1,003,056	10.19
1957	226,162	1,882,100	8.32
1958	281,281	2,187,769	7.78
1959	352,774	3,056,047	8.66
1960	321,685	3,502,504	10.89
1961	283,907	3,104,802	10.94
1962	415,122	4,444,041	10.71
1963	98,620	1,268,411	12.86
1964	3,144	55,485	17.65
1965	5,942	73,714	12.41
1966	52,152	456,000	8.74
1967	142,793	1,231,000	8.62
1968	83,698	680,000	8.12

4. Brazil

1949	13,203	221,179	16.75
1950	105,975	1,555,178	14.67
1951	202,557	4,937,658	24.38
1952	146,179	3,460,798	23.68
1953	41,717	429,242	10.29
1954	80,935	721,809	8.92
1955	174,696	1,510,385	8.65
1956	255,794	2,194,303	8.58
1957	248,832	1,895,437	7.62
1958	142,008	1,049,183	7.39
1959	108,219	884,229	8.17
1960	64,735	652,559	10.08
1961	68,667	705,120	10.27
1962	125,351	1,302,991	10.39
1963	146,211	2,462,454	16.84
1964	150,180	2,523,454	16.80
1965	234,981	2,285,002	9.72
1966	214,020	1,925,000	8.99
1967	156,126	1,104,000	7.07
1968	66,302	417,000	6.29

Table 4
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>5. Republic of Haiti</u>			
1949	38,053	764,682	20.10
1950	68,654	1,191,021	17.35
1951	115,620	2,558,447	22.13
1952	56,362	1,188,131	21.08
1953	37,487	436,604	11.65
1954	95,416	995,444	10.43
1955	137,444	1,264,675	9.20
1956	140,035	1,288,108	9.20
1957	164,015	1,246,122	7.60
1958	95,930	673,955	7.03
1959	104,960	826,291	7.87
1960	79,617	753,613	9.47
1961	67,348	577,870	8.58
1962	41,078	380,946	9.27
1963	62,444	893,856	14.31
1964	45,972	631,837	13.74
1965	69,168	597,259	8.63
1966	102,271	783,000	7.66
1967	113,494	849,000	7.48
1968	124,969	928,000	7.43

6. Mexico

1949	130,339	1,962,993	15.06
1950	240,201	2,986,976	12.44
1951	211,433	2,981,279	14.10
1952	145,040	2,201,199	15.18
1953	109,913	1,182,644	10.76
1954	109,358	953,009	8.71
1955	63,637	514,198	8.08
1956	28,185	232,487	8.25
1957	70,763	547,606	7.74
1958	55,815	401,272	7.19
1959	109,580	776,495	7.09
1960	76,898	735,914	9.57
1961	80,675	728,426	9.03
1962	96,335	897,308	9.31
1963	109,621	1,353,276	12.35
1964	88,335	1,212,753	13.73
1965	119,342	998,761	8.37
1966	87,392	708,000	8.10
1967	36,564	282,000	7.71
1968	9,885	73,000	7.38

Table 4
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>7. Kenya</u>			
1949-57	-	-	-
1958	37,766	297,707	7.88
1959	50,223	433,867	8.64
1960	4,368	38,856	8.90
1961	35,204	352,855	10.02
1962	39,485	416,877	10.56
1963	115,588	2,063,051	17.85
1964	118,481	2,278,676	19.23
1965	102,448	1,198,885	11.70
1966	91,151	1,028,000	11.28
1967	56,233	513,000	9.12
1968	55,531	402,000	7.24
<u>8. Tanganyika</u>			
1949-59	-	-	-
1960	33,087	329,977	9.97
1961	82,294	871,568	10.59
1962	110,860	1,230,121	11.10
1963	351,138	5,362,663	15.27
1964	363,775	6,642,201	18.26
1965-68 ^(b)	-	-	-
<u>9. Tanzania^(c)</u>			
1965	254,610	3,027,638	11.89
1966	247,706	2,642,000	10.67
1967	166,361	1,383,000	8.31
1968	160,590	1,289,000	8.03
<u>10. Mozambique</u>			
1949-57	-	-	-
1958	1,679	13,063	7.78
1959	-	-	-
1960	-	-	-
1961	894	9,390	10.50
1962	9,555	91,842	9.61
1963	24,973	338,243	13.54
1964	18,027	270,954	15.03
1965	19,605	245,329	12.51
1966	1,120	13,000	11.61
1967	886	7,000	7.90
1968	6,162	35,000	5.68

Table 4
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>11. Africa British East</u>			
1949	67,767	1,160,645	17.13
1950	61,953	1,063,989	17.17
1951	85,086	2,418,687	28.43
1952	111,589	2,656,737	23.81
1953	78,988	1,006,940	12.75
1954	82,844	859,231	10.37
1955	75,769	663,866	8.76
1956	86,858	802,350	9.24
1957	21,201	161,558	7.62
1958-68	-	-	-
<u>12. Belgium & Luxembourg</u>			
1949	212	6,296	29.70
1950	34	875	25.74
1951	34	1,335	39.26
1952	1,653	39,051	23.62
1953	52	1,144	22.00
1954	30	990	33.00
1955	-	-	-
1956	16	503	31.44
1957	300	4,181	13.94
1958-60	-	-	-
1961	1,103	12,072	10.94
1962-68	-	-	-
<u>13. Chile</u>			
1949	604	26,683	44.18
1950	149	6,309	42.34
1951	425	15,258	35.90
1952	718	22,774	31.72
1953-68	-	-	-
<u>14. Cuba</u>			
1949	21,150	319,598	15.11
1950	19,604	250,188	12.76
1951	21,338	554,826	26.00
1952	27,925	630,156	22.57
1953	59,964	580,264	9.68
1954	59,316	463,733	7.82
1955	48,417	397,952	8.22
1956	-	-	-
1957	-	-	-
1958	1,044	7,595	7.27
1959	2,596	15,655	6.03
1960-68	-	-	-

Table 4
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>15. Indonesia</u>			
1949	-	-	-
1950	-	-	-
1951	2,609	87,379	33.49
1952	5,015	134,388	26.80
1953	1,170	13,101	11.20
1954	5,038	52,587	10.44
1955	3,359	33,006	9.83
1956	1,665	14,833	8.91
1957-59	-	-	-
1960	2,241	13,304	5.94
1961-65	-	-	-
1966	210	2,000	9.52
1967	546	6,000	10.99
1968 Jan.-Oct.	1,099	7,000	6.37
<u>16. Portuguese Africa</u>			
1949	11,790	206,152	17.49
1950	5,319	108,502	20.40
1951	2,797	71,444	25.54
1952	26,302	536,187	20.39
1953	3,136	41,594	13.26
1954	19,959	206,725	10.36
1955	15,697	149,022	9.49
1956	39,763	413,406	10.40
1957	2,016	17,230	8.55
1958	1,100	7,258	6.60
1959-68	-	-	-
<u>17. Venezuela</u>			
1949	-	-	-
1950	551	7,095	12.88
1951	1,110	28,831	25.97
1952	11,435	267,459	23.39
1953-55	-	-	-
1956	677	5,973	8.82
1957-68	-	-	-
<u>18. Dominican Republic</u>			
1949-51	-	-	-
1952	3,141	77,812	24.77
1953	-	-	-
1954	-	-	-
1955	273	2,564	9.39
1956	8,507	87,970	10.34
1957	18,483	135,601	7.34
1958	1,281	10,073	7.86
1959-68	-	-	-

Table 4
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>19. Panama</u>			
1949-53	-	-	-
1954	135	3,211	23.79
1955-68	-	-	-
<u>20. Madagascar</u>			
1949-52	-	-	-
1953	662	7,923	11.97
1954	24,582	268,254	10.91
1955-68	-	-	-
<u>21. Philippines</u>			
1949-51	-	-	-
1952	1,134	20,253	17.86
1953-68	-	-	-
<u>22. India</u>			
1949-56	-	-	-
1957	400	2,946	7.37
1958	-	-	-
1959	27,331	222,047	8.12
1960	7,044	59,587	8.46
1961	1,024	8,090	7.90
1962	6,442	71,537	11.10
1963	14,888	162,515	10.92
1964-68	-	-	-
<u>23. Norway</u>			
1949-55	-	-	-
1956	23	500	21.74
1957-68	-	-	-
<u>24. Angola</u>			
1949-59	-	-	-
1960	1,609	13,184	8.19
1961	561	4,787	8.53
1962	3,093	27,975	9.04
1963	9,727	102,780	10.57
1964	7,576	83,816	11.06
1965	5,332	39,224	7.36
1966	-	-	-
1967	5,859	33,000	5.63
1968	4,684	28,000	5.98

Table 4
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>25. El Salvador</u>			
1949-58	-	-	-
1959	395	3,328	8.43
1960-68	-	-	-
<u>26. Republic of South Africa</u>			
1949-60	-	-	-
1961	3,673	35,227	9.59
1962	10,293	106,399	10.34
1963	7,614	142,364	18.70
1964-68	-	-	-
<u>27. Australia</u>			
1949-60	-	-	-
1961	1,125	7,182	6.38
1962	2,250	13,867	6.16
1963-68	-	-	-
<u>28. Nyasaland</u>			
1949-63	-	-	-
1964	336	4,627	13.77
1965-68	-	-	-
<u>29. French Africa</u>			
1949-62	-	-	-
1963	13,126	257,239	19.60
1964	58,476	1,079,041	18.45
1965	2,209	26,649	12.06
1966-68	-	-	-
<u>30. Malagasy Rep.</u>			
1949-64	-	-	-
1965	53,765	635,743	11.82
1966	48,446	507,000	10.47
1967	16,542	174,000	10.52
1968	-	-	-

Table 4
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
	<u>31. Ireland</u>		
1949-66	-	-	-
1967	1,133	24,000	21.18
1968	723	15,000	20.75
	<u>32. Portugal</u>		
1949-67	-	-	-
1968	661	4,000	6.05

- (a) Prior to 1964, statistical class 3413, Sisal, istle and tampico fibre
 (b) From January 1, 1965 included in Tanzania
 (c) Beginning January 1, 1965 includes Tanganyika and Zanzibar

Imports: Binder twine s.c. 369-05^(a)

Table 5

Tariff Item 40922-1

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
	<u>1. Total</u>		
1949	4,609	104,705	22.72
1950	11,289	239,756	21.24
1951	5,198	199,648	38.41
1952	12,386	372,816	30.10
1953	21,529	457,570	21.25
1954	37,387	589,389	15.76
1955	41,134	528,233	12.84
1956	51,041	700,410	13.72
1957	30,819	419,246	13.60
1958	29,377	375,103	12.77
1959	47,982	615,604	12.83
1960	36,914	530,502	14.37
1961	45,799	683,634	14.93
1962	22,606	339,820	15.03
1963	16,290	283,519	17.40
1964	16,818	334,571	19.89
1965	11,779	245,770	20.87
1966	10,057	181,000	18.00
1967	14,394	211,000	14.66
1968	14,152	187,000	13.21
	<u>2. United Kingdom</u>		
1949	3,500	82,480	23.57
1950	10,000	214,999	21.50
1951	5,078	197,732	38.94
1952	10,563	324,443	30.72
1953	6,102	129,854	21.28
1954	5,941	102,978	17.33
1955	3,723	60,564	16.27
1956	4,593	73,004	15.89
1957	2,775	40,894	14.74
1958	1,818	26,308	14.47
1959	6,840	100,629	14.71
1960	6,120	90,373	14.77
1961	5,111	75,564	14.78
1962	4,159	63,970	15.38
1963	2,039	37,232	18.26
1964	2,780	64,742	23.29
1965	2,795	55,811	19.97
1966	455	8,000	17.58
1967	45	3,000	66.67
1968	145	4,000	27.59

Table 5
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>3. United States</u>			
1949	9	261	29.00
1950	109	1,824	16.73
1951	116	1,753	15.11
1952	204	6,547	32.09
1953	6,726	165,251	24.57
1954	4,405	77,958	17.70
1955	4,426	63,939	14.45
1956	52	746	14.35
1957	269	4,709	17.51
1958	-	-	-
1959	7	81	11.57
1960	423	6,505	15.38
1961	319	4,568	14.32
1962	29	437	15.07
1963	61	920	15.08
1964	27	1,107	41.00
1965	119	9,302	78.17
1966	1,279	47,000	36.75
1967	-	-	-
1968	1,065	24,000	22.53
<u>4. Belgium & Luxembourg</u>			
1949	1,100	21,964	19.97
1950	660	13,759	20.85
1951	-	-	-
1952	492	14,538	29.55
1953	5,733	105,139	18.34
1954	6,737	96,014	14.25
1955	2,340	29,590	12.65
1956	3,486	44,967	12.90
1957	4,321	55,319	12.80
1958	5,480	66,430	12.12
1959	4,500	53,865	11.97
1960	2,400	32,500	13.54
1961	5,171	73,478	14.21
1962	1,344	22,341	16.62
1963	1,440	28,730	19.95
1964	-	-	-
1965	1,464	29,880	20.41
1966	728	11,000	15.11
1967	851	12,000	14.10
1968	-	-	-

Table 5
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>5. Mexico</u>			
1949	-	-	-
1950	10	137	13.70
1951	4	163	40.75
1952	925	20,940	22.64
1953	2,002	36,127	18.05
1954	7,219	104,255	14.44
1955	7,164	79,586	11.11
1956	5,270	68,579	13.01
1957	1,157	17,977	15.54
1958	398	5,707	14.34
1959	110	1,357	12.34
1960	940	12,284	13.07
1961	1,555	19,716	12.68
1962	1,000	13,080	13.08
1963	4,000	53,008	13.25
1964	-	-	-
1965	650	11,688	17.98
1966	100	1,000	10.00
1967	1,018	17,000	16.70
1968	-	-	-
<u>6. Netherlands</u>			
1949	-	-	-
1950	510	9,037	17.72
1951	-	-	-
1952	202	6,348	31.43
1953	966	21,199	21.95
1954	10,194	168,567	16.54
1955	7,646	110,209	14.41
1956	11,515	173,893	15.10
1957	11,442	162,346	14.19
1958	7,155	92,203	12.89
1959	8,783	107,301	12.22
1960	7,624	110,429	14.48
1961	10,037	159,267	15.87
1962	10,208	157,271	15.41
1963	4,142	73,662	17.78
1964	2,127	48,832	22.96
1965	3,095	62,353	20.15
1966	471	7,000	14.86
1967	551	8,000	14.52
1968	542	7,000	12.92

Table 5
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>7. Denmark</u>			
1949	-	-	-
1950	-	-	-
1951	-	-	-
1952	-	-	-
1953	-	-	-
1954	2,086	27,292	13.08
1955	15,817	184,096	11.64
1956	21,078	276,817	13.13
1957	6,440	81,670	12.68
1958	10,552	137,188	13.00
1959	19,347	257,394	13.30
1960	17,875	255,945	14.32
1961	14,803	232,189	15.69
1962	3,348	49,053	14.65
1963	3,554	60,108	16.91
1964	3,049	69,255	22.71
1965	1,673	31,359	18.74
1966	1,607	26,000	16.18
1967	1,677	25,000	14.91
1968	1,519	19,000	12.51
<u>8. Portugal</u>			
1949	-	-	-
1950	-	-	-
1951	-	-	-
1952	-	-	-
1953	-	-	-
1954	-	-	-
1955	18	249	13.83
1956	-	-	-
1957	1,094	14,104	12.89
1958	2,647	31,223	11.80
1959	2,080	23,567	11.33
1960	507	7,242	14.28
1961	6,025	79,163	13.14
1962	2,518	33,668	13.37
1963	650	15,289	23.52
1964	608	13,123	21.58
1965	1,431	24,607	17.20
1966	1,361	20,000	14.70
1967	3,314	47,000	14.18
1968	3,111	38,000	12.22
<u>9. Tanzania</u>			
1949-66	-	-	-
1967	6,005	86,000	14.32
1968	7,771	95,000	12.22

Table 5
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>10. Cuba</u>			
1949-53	-	-	-
1954	185	3,192	17.25
1955-59	-	-	-
1960	1,025	15,224	14.85
1961-63	-	-	-
1964	7,500	111,315	14.84
1965	-	-	-
1966	4,057	60,000	14.79
1967-68	-	-	-
<u>11. Germany, Fed. Rep. of</u>			
1949-53	-	-	-
1954	620	9,133	14.73
1955	-	-	-
1956	5,047	62,404	12.36
1957	3,321	42,227	12.72
1958	1,327	16,044	12.09
1959	6,315	71,410	11.31
1960	-	-	-
1961	1,025	14,038	13.70
1962-68	-	-	-
<u>12. Sweden</u>			
1949-60	-	-	-
1961	1,753	25,651	14.63
1962-68	-	-	-
<u>13. France</u>			
1949-62	-	-	-
1963	404	14,570	36.06
1964	727	26,197	36.03
1965	553	20,770	37.56
1966-68	-	-	-
<u>14. Angola</u>			
1949-66	-	-	-
1967	335	6,000	17.91
1968	-	-	-
<u>15. Brazil</u>			
1949-66	-	-	-
1967	600	7,000	11.67
1968	-	-	-

(a) Statistical class 3422 prior to 1964

Imports: Baler twine s.c. 369-03(a)

Table 6

Tariff Item 40922-1

Year	<u>Total Imports</u>		<u>Unit Value</u> \$/cwt.
	cwt.	\$	
	<u>1. Total</u>		
1955	58,768	781,217	13.29
1956	76,781	1,035,000	13.48
1957	112,112	1,539,414	13.73
1958	117,939	1,507,192	12.78
1959	164,048	2,068,962	12.61
1960	197,863	2,616,158	13.22
1961	299,729	4,449,884	14.85
1962	227,575	3,386,019	14.88
1963	237,851	3,894,859	16.38
1964	316,470	6,363,665	20.11
1965	310,342	5,502,045	17.73
1966	401,145	5,806,000	14.47
1967	510,374	6,917,000	13.55
1968	459,749	5,407,000	11.76
	<u>2. United Kingdom</u>		
1955	9,022	149,794	16.60
1956	13,317	209,722	15.75
1957	29,490	414,155	14.04
1958	25,816	362,049	14.02
1959	48,575	636,714	13.11
1960	38,834	496,298	12.78
1961	64,683	994,257	15.37
1962	46,177	737,317	15.97
1963	39,680	726,479	18.31
1964	48,600	1,105,097	22.74
1965	30,090	582,413	19.36
1966	20,910	324,000	15.49
1967	37,285	563,000	15.10
1968	8,563	112,000	13.08
	<u>3. United States</u>		
1955	8,483	102,771	12.11
1956	600	9,498	15.83
1957	15,087	247,815	16.43
1958	87	1,201	13.80
1959	844	10,839	12.84
1960	919	13,303	14.48
1961	758	12,883	17.00
1962	3,270	50,267	15.37
1963	9	253	28.11
1964	410	14,052	34.27
1965	13,340	307,615	23.06
1966	5,545	161,000	29.04
1967	4,710	101,000	21.44
1968	13,354	201,000	15.05

Table 6
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>4. Belgium & Luxembourg</u>			
1955	4,360	55,655	12.76
1956	6,379	79,371	12.44
1957	11,002	141,095	12.82
1958	14,981	183,790	12.27
1959	13,828	168,241	12.17
1960	13,574	172,599	12.72
1961	24,300	335,712	13.82
1962	14,362	192,313	13.39
1963	24	731	30.46
1964	3,269	76,486	23.40
1965	5,767	106,166	18.41
1966	6,363	93,000	14.62
1967	17,386	236,000	13.57
1968	8,291	100,000	12.06
<u>5. Cuba</u>			
1955	-	-	-
1956	2,880	36,099	12.53
1957	-	-	-
1958	11,040	134,175	12.15
1959	20,839	245,466	11.78
1960	43,364	517,992	11.95
1961	27,200	367,029	13.49
1962	13,549	187,021	13.80
1963	20,282	285,899	14.10
1964	88,184	1,310,161	14.86
1965	9,202	151,237	16.44
1966	61,926	800,000	12.92
1967	21,776	249,000	11.43
1968	27,600	309,000	11.20
<u>6. Denmark</u>			
1955	5,506	84,862	15.41
1956	11,995	166,601	13.89
1957	11,292	149,542	13.24
1958	22,287	299,832	13.45
1959	34,671	475,346	13.71
1960	47,116	675,408	14.34
1961	70,070	1,110,071	15.84
1962	38,260	579,721	15.15
1963	36,217	600,480	16.58
1964	35,585	812,951	22.85
1965	32,159	611,175	19.00
1966	45,657	704,000	15.42
1967	43,529	635,000	14.59
1968	29,062	368,000	12.66

Table 6
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>7. Mexico</u>			
1955	21,777	225,943	10.38
1956	31,855	394,073	12.37
1957	24,051	306,505	12.74
1958	7,620	82,335	10.81
1959	4,554	49,488	10.87
1960	9,579	135,497	14.15
1961	20,134	265,385	13.18
1962	2,950	43,978	14.91
1963	44,800	574,769	12.83
1964	48,996	1,028,667	20.99
1965	41,698	720,874	17.29
1966	70,615	962,000	13.62
1967	83,304	1,049,000	12.59
1968	88,287	1,001,000	11.34
<u>8. Netherlands</u>			
1955	9,620	162,192	16.86
1956	9,755	139,636	14.31
1957	12,352	171,013	13.84
1958	19,572	245,467	12.54
1959	21,938	265,560	12.11
1960	19,344	272,046	14.06
1961	27,652	423,647	15.32
1962	17,352	278,103	16.03
1963	12,183	217,046	17.82
1964	15,880	363,311	22.88
1965	7,958	152,450	19.16
1966	6,856	102,000	14.88
1967	11,527	151,000	13.10
1968	5,476	64,000	11.69
<u>9. Portugal</u>			
1955	-	-	-
1956	-	-	-
1957	7,708	92,448	11.99
1958	16,376	196,085	11.97
1959	12,031	138,588	11.52
1960	14,964	197,625	13.21
1961	58,897	854,170	14.50
1962	83,102	1,179,700	14.20
1963	76,009	1,347,153	17.72
1964	72,049	1,592,212	22.10
1965	124,049	2,063,341	16.63
1966	137,932	2,047,000	14.84
1967	140,358	1,967,000	14.01
1968	131,524	1,597,000	12.14

Table 6
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>10. Tanzania</u>			
1955-64	-	-	-
1965	29,232	503,476	17.22
1966	28,200	381,000	13.51
1967	62,315	804,000	12.90
1968	85,357	910,000	10.66
<u>11. Germany, Fed. Rep. of</u>			
1955-56	-	-	-
1957	890	13,548	15.22
1958	160	2,258	14.11
1959	1,102	14,301	12.98
1960-66	-	-	-
1967	2,925	37,000	12.65
1968	-	-	-
<u>12. Ireland</u>			
1955-56	-	-	-
1957	240	3,293	13.72
1958-68	-	-	-
<u>13. Dominican Republic</u>			
1955-58	-	-	-
1959	5,666	64,419	11.37
1960	2,800	33,492	11.96
1961-68	-	-	-
<u>14. Haiti</u>			
1955-59	-	-	-
1960	7,369	101,898	13.83
1961	3,683	52,307	14.20
1962	2,040	32,130	15.75
1963	5,200	84,510	16.25
1964	-	-	-
1965	9,000	161,362	17.93
1966-68	-	-	-
<u>15. Sweden</u>			
1955-60	-	-	-
1961	2,352	34,423	14.64
1962	4,563	76,069	16.67
1963	3,447	57,539	16.69
1964	3,497	60,728	17.37
1965	4,460	81,081	18.18
1966	501	9,000	17.96
1967	3,642	68,000	18.67
1968	2,264	48,000	21.20

Table 6
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>
	cwt.	\$	\$/cwt.
<u>16. Rep. of South Africa</u>			
1955-61	-	-	-
1962	1,950	29,400	15.08
1963-68	-	-	-
<u>17. Italy</u>			
1955-64	-	-	-
1965	3,386	60,855	17.97
1966	6,981	101,000	14.47
1967	7,875	105,000	13.33
1968	-	-	-
<u>18. Angola</u>			
1955-65	-	-	-
1966	8,070	102,000	12.64
1967	39,770	542,000	13.63
1968	46,180	583,000	12.62
<u>19 Brazil</u>			
1955-65	-	-	-
1966	1,590	21,000	13.21
1967	22,311	267,000	11.97
1968	13,650	113,000	8.28
<u>20. Kenya</u>			
1955-66	-	-	-
1967	3,663	46,000	12.56
1968	140	2,000	14.29
<u>21. Mozambique</u>			
1955-66	-	-	-
1967	8,000	97,000	12.13
1968	-	-	-

(a) Statistical class 3420 prior to 1964

Table 7

Imports of Binder Twine and Baler Twine,
by Province of Entry, 1963-1967

Type of Twine	1963		1964		1965		1966		1967	
	Quantity lb. (000)	Value \$ (000)	Quantity lb. (000)	Value \$ (000)	Quantity lb. (000)	Value \$ (000)	Quantity lb. (000)	Value \$ (000)	Quantity lb. (000)	Value \$ (000)
<u>Binder Twine</u>										
Newfoundland	-	-	-	-	-	-	-	-	-	-
Nova Scotia	-	-	-	-	-	-	25	4	10	1
Prince Edward Island	-	-	-	-	-	-	-	-	-	-
New Brunswick	46	8	44	9	24	5	44	7	27	3
Quebec	225	43	953	168	248	59	583	87	849	121
Ontario	402	76	186	42	298	60	234	65	349	54
Manitoba	120	17	50	11	121	24	-	-	-	-
Saskatchewan	74	13	14	4	31	6	14	2	-	-
Alberta	5	1	2	*	-	-	2	1	-	-
British Columbia	757	125	432	100	456	92	104	17	205	31
Total	1,629	284	1,682	335	1,178	246	1,006	181	1,439	211
<u>Baler Twine</u>										
Newfoundland	4	1	4	1	4	1	-	-	-	-
Nova Scotia	48	9	182	42	464	81	2,472	371	964	134
Prince Edward Island	12	2	32	7	43	9	25	4	25	4
New Brunswick	322	59	531	121	677	117	1,617	228	1,259	150
Quebec	6,199	917	13,594	2,329	7,610	1,327	10,859	1,493	13,874	1,869
Ontario	8,548	1,441	8,821	1,968	11,033	1,923	12,159	1,782	17,795	2,393
Manitoba	860	113	1,409	294	1,214	251	1,591	259	3,508	456
Saskatchewan	522	93	616	149	923	193	985	162	1,123	183
Alberta	46	8	358	88	338	77	558	102	118	19
British Columbia	7,224	1,252	6,101	1,365	8,728	1,524	9,848	1,405	12,373	1,710
Total	23,785	3,895	31,647	6,364	31,034	5,502	40,115	5,806	51,037	6,917

Table 8

Exports: Binder Twine, s.c. 369-05^(a)

<u>Year</u>	<u>Quantity</u> cwt.	<u>Value</u> \$	<u>Unit Value</u> \$/cwt.
<u>1. Total</u>			
1949	311,381	5,789,694	18.59
1950	174,936	3,231,103	18.47
1951	260,659	4,706,092	18.05
1952	174,778	3,849,501	22.03
1953	229,582	3,988,593	17.37
1954	138,233	2,252,516	16.30
1955	94,152	1,388,634	14.75
1956	74,447	1,143,513	15.36
1957	56,472	858,533	15.20
1958	55,006	746,512	13.57
1959	43,014	586,425	13.63
1960	26,071	368,157	14.12
1961	22,424	341,507	15.23
1962	24,470	366,458	14.98
1963	28,696	479,249	16.70
1964	30,326	592,726	19.55
1965	26,298	453,048	17.23
1966	29,348	473,000	16.12
1967	14,886	236,000	15.85
1968	12,700	206,000	16.22
<u>2. United States</u>			
1949	208,056	3,686,001	17.72
1950	174,912	3,230,570	18.47
1951	260,547	4,702,247	18.05
1952	174,778	3,849,501	22.03
1953	229,532	3,987,729	17.37
1954	138,221	2,252,277	16.29
1955	94,152	1,388,634	14.75
1956	74,447	1,143,513	15.36
1957	56,472	858,533	15.20
1958	55,006	746,512	13.57
1959	43,014	586,425	13.63
1960	26,071	368,157	14.12
1961	22,424	341,507	15.23
1962	24,469	366,405	14.97
1963	28,696	479,249	16.70
1964	30,326	592,726	19.55
1965	26,298	453,048	17.23
1966	29,348	473,000	16.12
1967	14,779	232,000	15.70
1968	12,660	205,000	16.19

^(a) Statistical class 3330 prior to 1961

Table 9

Exports: Baler twine, s.c. 369-03^(a)

<u>Year</u>	<u>Quantity</u> cwt.	<u>Value</u> \$	<u>Unit</u> <u>Value</u> \$/cwt.
<u>1. Total</u>			
1960	173,367	2,717,012	15.67
1961	188,867	3,146,622	16.66
1962	219,290	3,523,861	16.07
1963	276,093	5,040,931	18.26
1964	232,842	5,045,303	21.67
1965	407,368	7,786,846	19.12
1966	356,408	5,860,000	16.44
1967	235,907	3,705,000	15.71
1968	167,174	2,592,000	15.50
<u>2. United States</u>			
1960	173,367	2,717,012	15.67
1961	188,867	3,146,622	16.66
1962	219,290	3,523,861	16.07
1963	276,093	5,040,931	18.26
1964	232,642	5,039,188	21.66
1965	406,966	7,776,316	19.11
1966	356,408	5,860,000	16.44
1967	235,907	3,705,000	15.71
1968	167,174	2,592,000	15.50

(a) Statistical class 3325 in 1960; class established in 1960, previously reported in s.c. 3340

Average Prices for Binder Twine
in Canada, 1947-1968

<u>Year</u>	<u>List Price</u> \$	<u>Reported Selling Price</u> ^(a)	
		<u>Domestic</u> \$	<u>Imported</u> \$
		(per 50 lb. bale)	
1947	9.00	..	..
1948	12.00	..	..
1949	12.50	..	..
1950	12.50	..	..
1951	18.25	..	..
1952	18.75	..	..
1953	14.25	..	..
1954	10.60	..	..
1955	9.65	..	..
1956	10.30	..	..
1957	9.10	..	..
1958	9.13	8.13	..
1959	9.02	7.64	..
1960	8.85	8.00	..
1961	9.55	8.63	..
1962	9.05	8.24	..
1963	11.30	9.44	9.68
1964	12.80	11.28	12.30
1965	11.40	10.75	10.76
1966	10.40	9.32	9.11
1967	10.20	8.72	8.50
1968	9.70	8.70	7.58

^(a) Average prices excluding discounts

Source: Transcript and Tariff Board questionnaire

Average Prices for Baler Twine
in Canada, 1947-1968

<u>Year</u>	<u>List Price</u> \$	<u>Reported Selling Price</u>	
		<u>Domestic^(a)</u> \$	<u>Imported^(a)</u> \$
		(per 40 lb. bale)	
1947	8.80	..	..
1948	10.00	..	..
1949	10.40	..	..
1950	10.40	..	..
1951	12.80	..	..
1952	16.80	..	..
1953	11.80	..	..
1954	8.90	..	..
1955	8.25	..	..
1956	8.75	..	..
1957	8.05	..	..
1958	8.12	7.11	..
1959	7.74	6.57	..
1960	7.75	6.77	..
1961	8.05	7.02	..
1962	7.35	6.35	..
1963	9.65	7.77	8.04
1964	10.80	9.55	10.23
1965	9.70	8.23	8.63
1966	8.20	7.13	7.00
1967	7.90	6.61	6.60
1968	6.85	5.92	5.86

(a) Average prices excluding discounts

Source: Transcript and Tariff Board questionnaire

Table 12

Agreed Freight Charges from Brantford, Kitchener, Hamilton,
and Welland, to Various Destinations in Canada,
Selected Years 1960-1968

Destination	1963			1968		
	All	Rail,Lake	Water	All	Rail,Lake	Water
	<u>Rail</u>	<u>& Rail</u>	<u>& Rail</u>	<u>Rail</u>	<u>& Rail</u>	<u>& Rail</u>
	\$/cwt. (100,000 lb. Minimum)					
<u>Western Canada</u>						
Winnipeg, Man.	1.27 $\frac{1}{2}$	1.22 $\frac{1}{2}$	1.19 $\frac{1}{2}$	1.40	1.35	1.32
Brandon, Man.	1.73 $\frac{1}{2}$	1.68 $\frac{1}{2}$	1.65 $\frac{1}{2}$	1.76	1.71	1.68
Regina, Sask.	1.72 $\frac{1}{2}$	1.67 $\frac{1}{2}$	1.64 $\frac{1}{2}$	1.90	1.85	1.82
Prince Albert, Sask.	1.94 $\frac{1}{2}$	1.89 $\frac{1}{2}$	1.86 $\frac{1}{2}$	2.14	2.09	2.06
Saskatoon, Sask.	1.94 $\frac{1}{2}$	1.89 $\frac{1}{2}$	1.86 $\frac{1}{2}$	2.14	2.09	2.06
Swift Current, Sask.	-	-	-	2.14	2.09	2.06
Yorkton, Sask.	-	-	-	2.21	2.16	2.13
Brooks, Alta.	2.42 $\frac{1}{2}$	2.37 $\frac{1}{2}$	2.34 $\frac{1}{2}$	2.51	2.46	2.43
Calgary, Alta.	2.28 $\frac{1}{2}$	2.23 $\frac{1}{2}$	2.20 $\frac{1}{2}$	2.51	2.46	2.43
Edmonton, Alta.	2.28 $\frac{1}{2}$	2.23 $\frac{1}{2}$	2.20 $\frac{1}{2}$	2.51	2.46	2.43
Lethbridge, Alta.	2.28 $\frac{1}{2}$	2.23 $\frac{1}{2}$	2.20 $\frac{1}{2}$	2.51	2.46	2.43
Medicine Hat, Alta.	-	-	-	2.51	2.46	2.43
Red Deer, Alta.	-	-	-	2.51	2.46	2.43
Camrose, Alta.	-	-	-	2.59	2.54	2.51
Grand Prairie, Alta.	-	-	-	3.34	3.29	3.26
Vancouver(a)	2.20(d)	-	-	2.57	-	-
Fort William(a)	0.91	0.83(d)	-	1.05	0.98	-
Winnipeg, Man.(b)	0.77(d)	-	-	0.91	-	-

Eastern Canada (From Hamilton to various destinations in carloads
of 24,000 pounds minimum)

	<u>1960</u>		<u>1968</u>		
London	0.57	-	0.66	-	-
Montreal(c)	1.14	-	1.27	-	-
Quebec City	1.49	-	1.64	-	-
Saint John, N.B.	1.49	-	1.49	-	-

- (a) From Hamilton only - Rail Commodity Rates and Proportional Rates
 (b) From Fort William - Rail Commodity Rates
 (c) Rail Commodity Rates from Hamilton to Montreal were \$0.65 in 1963
 and \$0.81 in 1968
 (d) Rates for year 1960

Source: Canadian Freight Association, Agreed Charges and Company
Submissions to the Tariff Board

Incentive Loading Rail Charges from Vancouver and
Fort William to Western Destinations, Canada,
1964 and 1968

		<u>1964</u>	<u>1968</u>
		(\$/cwt.)	(\$/cwt.)
		(Minimum Representative Weight 60,000 pounds)	
<u>From:</u>	<u>Vancouver</u>		
<u>To:</u>	Calgary	0.85	1.04
	Edmonton	0.86	1.05
	Lethbridge	1.00	1.05
	Lloydminster	1.45	1.75
	Medicine Hat	1.05	1.05
	Red Deer	1.00	1.05
	Stettler	1.20	1.45
	Regina	1.45	1.75
	Saskatoon	1.45	1.75
	Prince Albert	-	1.75
	Moose Jaw	-	1.75

From: Fort William

<u>To:</u>	Calgary	-	2.24
	Edmonton	-	2.24
	Lethbridge	-	2.48
	Lloydminster	-	2.34
	Medicine Hat	-	2.34
	Red Deer	-	2.24
	Stettler	-	2.51
	Regina	-	1.58
	Saskatoon	-	1.83
	Prince Albert	-	1.83
	Moose Jaw	-	1.65

Source: Company Submission to the Tariff Board

Table 14

Comparative Freight Rates of
Domestic and Imported Baler Twine
1967-1968(a)

<u>Domestic & Imported</u>	<u>From:</u>	<u>To:</u>	Rate per bale - <u>40 lb.</u> ¢/bale(b)
<u>Domestic</u>	Brantford, Welland, Hamilton & Kitchener	Montreal	30.0
<u>Imported</u>	Tanzania/Kenya	Halifax/Montreal	71.6
	Angola	" "	64.0
	Brazil (Salvador)	" "	54.8
	Mexico	Montreal	55.2
	United Kingdom	Halifax/Montreal	41.6
	Denmark	" "	50.0
	Portugal	" "	53.6
	Belgium	Montreal	49.2
	South Africa (Durban)	"	65.2
	Mozambique	"	70.4
<u>Domestic</u>	Brantford, Welland, Hamilton & Kitchener	Toronto	16.0
<u>Imported</u>	Tanzania/Kenya	Hamilton/Toronto	78.4
	Angola	" "	-
	Brazil (Salvador)	" "	60.0
	Mexico	Hamilton	60.8
	United Kingdom	Hamilton/Toronto	53.2
	Denmark	" "	68.0
	Portugal	" "	64.8
	Belgium	Hamilton	66.8
	South Africa (Durban)	"	-
	Mozambique	"	-
	Holland	"	72.0
<u>Domestic</u>	Brantford, Welland, Hamilton & Kitchener	Vancouver	102.8
<u>Imported</u>	Tanzania/Kenya	Vancouver	88.4
	Angola	"	-
	Brazil (Salvador)	"	77.2
	Mexico	"	-
	United Kingdom	"	-
	Denmark	"	66.8
	Portugal	"	60.4
	Belgium	"	-

Domestic Freight Rates, (Cont'd)

Table 14
(Cont'd)

<u>Domestic & Imported</u>	<u>From:</u>	<u>To:</u>	Rate per bale - <u>40 lb.</u> ¢/bale ^(b)
<u>Imported</u>	South Africa (Durban)	Vancouver	-
	Mozambique	"	-
<u>Domestic</u>	Brantford, Welland, Hamilton & Kitchener	Fort William	38.8
<u>Imported</u>	Tanzania/Kenya	Lakehead	80.4
	Angola	Hamilton/Lakehead	70.4
	Brazil	Lakehead	59.6
	Mexico	"	-
	United Kingdom	"	58.0
	Denmark	"	77.2
	Portugal	"	64.8
	Belgium	"	-
	South Africa (Durban)	"	-
	Mozambique	"	-
	Holland	"	72.0
<u>Domestic</u>	Brantford, Welland, Hamilton & Kitchener	Dartmouth, N.S.	48.8
		Moncton, N.B.	61.6
		Saint John, N.B.	59.6

(a) Converted from long ton of 2,240 lb. in Canadian funds; also some conversion per 1,000 kilos (2,205 lb.), U.S. funds to Canadian funds

(b) Rates do not include Port terminal and/or wharfage or Seaway tolls where applicable

Source: Derived from information supplied by companies

APPENDIX II

TARIFF HISTORY

APPENDIX IITariff HistoryTariff Item 40922-1 (GATT) - Previously 409e(3)

Binder twine; wire and twine for baling farm produce

	<u>B.P.</u>	<u>M.F.N.</u>	<u>General</u>
1953, February 20	Free	Free	Free

Prior to February 20, 1953 some of the goods in this item were provided for free of duty under all Tariffs in tariff item 538, viz.: Binder twine or twine for harvest binders

1948, January 1 (GATT)	Free
------------------------	------

1932, May 24 (New Zealand Trade Agreement)	Free
--	------

1928, February 17	Free	Free	Free
-------------------	------	------	------

Prior to February 17, 1928 binder twine or twine for harvest binders was provided for in tariff item 544 with the same wording and at the same rates. Tariff item 544 was introduced in 1906.

Prior to February 20, 1953 some of the other goods in the present item were provided for in tariff item 538b, viz.: Twine for baling farm produce

1950, June 1	Free	Free	25 p.c.
--------------	------	------	---------

Prior to June 1, 1950 these goods were dutiable under tariff items Ex. 537 and Ex. 537a, Twine for baling farm produce

1948, January 1 (GATT)	Free
------------------------	------

The M.F.N. rate automatically applied to importations from countries entitled to B.P. rates of duty.

CAI FN 55

-69K+3



CANADA

Report by *1-2-57*

THE TARIFF BOARD

Relative to the Investigation Ordered
by the Minister of Finance
respecting

POLYETHYLENE



Reference No. 143



Report by

THE TARIFF BOARD

Relative to the Investigation Ordered
by the Minister of Finance
respecting

POLYETHYLENE

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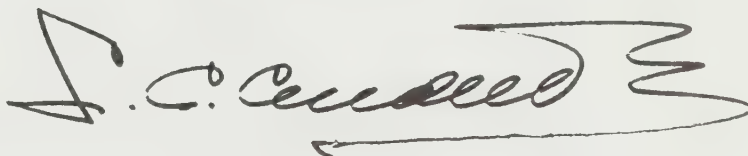
The Honourable
The Minister of Finance
Ottawa

Dear Mr. Minister:

I refer to your letter of October 23, 1968, in which you directed the Tariff Board to make a study and report as to whether any changes should be made in the rates of duty on polyethylene resins.

In conformity with Section 6 of the Tariff Board Act, I have the honour to transmit this Report of the Board relating to polyethylene resins in English and in French. A copy of the transcript of the proceedings at the public hearings accompanies the Report.

Yours faithfully

A handwritten signature in dark ink, appearing to read "J. C. Caudwell", with a long, sweeping horizontal flourish extending to the right.

Chairman

Explanation of Symbols Used

- Denotes zero or none reported
- .. Indicates that figures are not available
- * In statistical tables, indicates a reported figure which disappears on rounding, or is negligible
- (a) A small letter in brackets denotes a footnote to a table
- (1) A number in brackets denotes a footnote to the text
- s.c. Denotes a Dominion Bureau of Statistics import or export statistical class
- (p. --) Denotes a page from the transcript of proceedings at the public hearing unless the context clearly indicates another cited reference

The sum of the figures in a table may differ from the total, owing to rounding

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Ottawa, October 23, 1968

Mr. L.C. Audette
Chairman
The Tariff Board
Ottawa.

Dear Mr. Audette:

The Tariff Board in its report on Reference 120 recommended under item 39.02(a)4 that the $7\frac{1}{2}$ p.c. B.P. and M.F.N. rate of duty on polyethylene resins remain unchanged. Canadian producers of polyethylene resins have objected to this recommendation and have asked that the duty be 10 p.c., the rate for Canada accepted by our trading partners in the Kennedy Round of tariff negotiations. The producers contend that the information before the Board when it made its recommendation is now quite out of date. In particular, it is asserted that the size of plant required for efficient production has increased significantly, and that, more generally, there has been a drastic change in the demand and supply situation for polyethylene both in Canada and abroad. Accordingly, it is the industry's view that the factors on which the Board based its recommendation are no longer relevant.

It is my view that the Board's recommended rate of $7\frac{1}{2}$ p.c. for polyethylene resins should be implemented, pending a new study of the situation, and accordingly, the Government is proposing to do so by the introduction of new tariff item 93902-3. However, in view of the representations which have been received, I direct the Board to make a study and report under section 4(2) of the Tariff Board Act as to whether any changes should be made in the rates of duty under this item.

If the Board's study should indicate that amendments to the Customs Tariff are desirable, I would request the Board to include in its report recommendations concerning such amendments. (Should the study show that consequential amendments are required to tariff items covering other forms of polyethylene, these amendments should also be included.) I would assume that the Board would not recommend rates of duty higher than those to which Canada is committed internationally.

I ask that the Board carry out its review and make its report as expeditiously as possible.

Yours sincerely,

E.J. BENSON

Date of Public Hearing
and
List of Companies and Agencies
Which Made Representations

A public hearing before the Board was held at Ottawa on January 13, 14, 15 and 16, 1969.

Representations related to the hearing were received from the following:

(A) Submissions for the Public Hearing

Canadian Electrical Manufacturers Association	Toronto, Ontario
Canadian Industries Limited	Montreal, Quebec
Dow Chemical of Canada Limited	Sarnia, Ontario
Du Pont of Canada Limited	Montreal, Quebec
Union Carbide Canada Limited	Toronto, Ontario
Cryovac Limited (Grace)	Mississauga, Ontario
The Daymond Company Limited	Chatham, Ontario
Federal Plastics Mfg. Ltd.	Montreal, Quebec
Hardman Fittings Limited	Scarborough, Ontario
Imperial Oil Limited	Toronto, Ontario
Leco Industries Ltd.	Ville St. Laurent, Quebec
The Society of the Plastics Industry of Canada The Custom Moulders Division	Don Mills, Ontario
The Society of the Plastics Industry of Canada The Plastics Pipe & Fittings Division The Profile Extruders Division	Don Mills, Ontario
Thomas Bonar & Co. (Canada) Limited	Montreal, Quebec
Bonar & Bemis Ltd.	Winnipeg, Manitoba
W. Ralston & Co. (Canada) Ltd.	Toronto, Ontario

List of Representations (cont'd)

- (B) Correspondence listed in the agenda for the public hearing from producers or users of film, expressing opposition to an increase in rates of duty on polyethylene resin.

Allied Paper Products Ltd.	Ottawa, Ontario
Atlantic Packaging Company	Scarborough, Ontario
B. & C. Packagings Limited	Montreal, Quebec
Canada Packaging Ltd.	Montreal, Quebec
Canam Manufacturing & Packaging Ltd.	Brantford, Ontario
Cello Bags Ltd.	Toronto, Ontario
Clear Pack Inc.	Montreal, Quebec
Deerfield Laminations Limited	Newmarket, Ontario
Deerfield Plastics Limited	Newmarket, Ontario
Dominion Tape of Canada Ltd.	Cornwall, Ontario
Dorfin Paper Products Limited	Montreal, Quebec
Flexible Bag & Envelope Limited	Toronto, Ontario
Flexo Pack Mfg. Co. Ltd.	Montreal, Quebec
Gordon Haugh Packaging Company Limited	Toronto, Ontario
Halo Plastic Bag Manufacturing Company	Scarborough, Ontario
J. & J. Bag Company	Toronto, Ontario
Konoko Bag Limited	Toronto, Ontario
Modern Wrappings Limited	Toronto, Ontario
Molson Bag & Paper Company Ltd.	Toronto, Ontario
National Flexible Packages & Converting	Scarborough, Ontario
Nor Baker Limited	Toronto, Ontario
Poly-Cello Bags Limited	Saint John, New Brunswick
Polycraft Company Limited	Montreal, Quebec
Poly-Star Mfg. Inc.	Montreal, Quebec
Salerno Transparent Paper Bag Limited	LaSalle, Quebec
Seaforth Plastics Ltd.	North Burnaby, B.C.
Smith Packaging Limited	Toronto, Ontario
St. Johns Paper Products Co. Ltd.	Saint Jean, Québec
Trans Packaging Mfg. Co. Ltd.	Montreal, Quebec
Visipak Ltée-Ltd.	Montreal, Quebec
Vizo-Bag Limited	Toronto, Ontario

List of Representations (concluded)

- (C) Additional correspondence received during or after the public hearing, not listed in the agenda for the public hearing, from producers or users of film, expressing opposition to an increase in rates of duty on polyethylene resin.

Ackron Plastics, Division of Dylex Diversified	Rexdale, Ontario
Acme Sales Co. Ltd.	Montreal, Quebec
Clearview Paper Products Co. Reg'd.	Chomedey, Quebec
Clear View Products Limited	Scarborough, Ontario
Polypack Corporation Limited	Montreal, Quebec
Regency Plastics Company Ltd.	Downsview, Ontario
Transparent Garment Cover Co. Inc.	Montreal, Quebec

INTRODUCTION

In Reference 120, Chemicals, The Tariff Board reported, among other chemicals, on polyethylene in terms of circumstances up to 1964.⁽¹⁾ The present report is concerned with developments since that time. Much of the study deals with the supply of and demand for the basic forms of polyethylene resin which enter into the production of a very great number of products in the secondary, or fabricating, stage of the industry.

Polyethylene resins are produced in a number of densities and grades; the term "polyethylene" or "polyethylene resin" is here used to encompass all the basic forms.

Polyethylene is used in far greater volume in Canada than any other resin and has shown the greatest growth in the past five years. However, the number of manufacturers of basic resin continues to be four: Canadian Industries Limited, at Edmonton, Alberta, Dow Chemical of Canada Ltd., at Sarnia, Ontario, Du Pont of Canada Ltd. also at Sarnia and Union Carbide Canada Ltd., at Montreal East, Quebec. The companies, for the most part, in the past five years have not incurred large capital outlays either to build additional plants or to expand existing facilities to produce polyethylene resin. The companies have, however, made changes to existing plants which have enabled them to increase their production. One of the companies, Union Carbide, has issued press statements over the past year indicating an interest in building additional facilities to produce polyethylene but, for the most part, the producers claimed that there is little incentive under current circumstances to consider substantial capital outlays for the expansion of capacity in Canada. The outlook, therefore, and the capital investment of the past five years are in sharp contrast to the preceding years in which rapid growth in the productive capacity of the industry took place from its beginning in Edmonton in 1953.

Two other developments since 1964 are particularly important: a continuation, until recently, of the decline in the price of basic resins, and the emergence of a sizeable import balance of trade. It is principally in the light of these two factors that the resin producers claim that production in Canada is becoming less attractive and that rates of duty on the resin should be increased.

The Minister's letter of reference indicates clearly that in the event of a recommendation for an increase in rates of duty, the Board would not recommend rates of duty higher than those to which Canada is committed internationally. In effect, therefore, the Board might consider recommending an increase in the most-favoured-nation rate of duty from the existing $7\frac{1}{2}$ per cent to a maximum of 10 per cent; consequential changes of about the same order of magnitude, at somewhat higher levels, might be recommended for other forms of polyethylene such as compounds, film and sheet, but not on articles made from polyethylene.

It is against this general background and within these limitations that the Board's study was carried out.

(1) See particularly: Tariff Board, Report on Reference 120, Chemicals, Vol. 4 (Part 1) and Vol. 14

THE INDUSTRY AND THE PRODUCT

As noted above, there are four producers of basic resins in Canada. Estimates of the capacity of the plants for a number of years is given in table 1 where it may be seen that current capacity is estimated at about 300 million pounds. For a number of reasons, there are difficulties in arriving at firm estimates of capacity; for example, variations in the rate of operation result from changes in the particular type of polyethylene resin being produced. Union Carbide and Du Pont possess by far the largest part of this capacity; the increases in capacity of the plants in recent years have been achieved without major investment in new plant. The plants have been operating at or near their full practical capacity in meeting a substantial, but decreasing, part of the domestic demand and in exporting decreasing amounts of polyethylene to many markets abroad.

Table 1: Estimated Capacity to Produce Polyethylene Resin,
Selected Years, 1959-68

<u>Producer</u>	<u>Plant Location</u>	<u>Year Began</u>	<u>Capacity</u>				<u>Change</u>
			<u>1959</u>	<u>1964</u>	<u>1967</u>	<u>1968</u>	<u>1968</u> <u>1964</u>
			million pounds per year				per cent
Union Carbide	Montreal	1957	34	116	120	120	3
Du Pont	Sarnia	1959	30	50	60	100	100
C.I.L.	Edmonton	1953	25	45	60	60	33
Dow Chemical	Sarnia	1959	<u>6</u>	<u>14</u>	<u>18</u>	<u>18</u>	<u>29</u>
Total			95	225	258	298	32

Source: Tariff Board Report, Reference 120 and questionnaire;
Canadian Plastics, Canadian Chemical Processing; Financial
Post; Transcript, Vol. 1, p. 87

The estimated capacity in early 1969 is higher by about 40 million pounds than that shown in table 1 for 1968 as a result of additional capacity at the Union Carbide's plant in Montreal East. The capacity of the industry in early 1969, therefore, appears to have been nearly 340 million pounds.

The industry produces two main densities of polyethylene resin: low (specific gravity, 0.910 to 0.940) and high (specific gravity, 0.940 to 0.965). High and low density resins are generally produced by completely different equipment so that a company wanting to produce both types will, as a rule, require separate facilities for each. Medium ranges of density can be produced by either process, but the medium density resins produced by one process and those produced by the other are not necessarily identical. As noted in the market section which follows, the various densities of resins have distinctly different uses: the low densities are light and flexible and are used mainly to produce film and sheet; the high densities are rigid and are used mainly for such products as pipes and tubes, toys and household and industrial articles. In speaking of capacity and of market requirements, therefore, the distinction between high and low density

resins must always be kept in mind since the total capacity cannot be used for a full range of densities. Du Pont and Union Carbide have facilities to produce both high and low density resins; C.I.L. has concentrated on low and medium density resins, while Dow Chemical has concentrated on the high density resins. Of the 300 million pounds total capacity, about 250 million pounds is designed to produce low density resins, and 50 million to produce high density resins. However, Du Pont uses a unique process which can produce a full range of densities from high to low. This enables the company to meet demands for fairly small quantities of resins over a broad range of densities.

The producers of resins in Canada directed the Board's attention especially to world capacity. The Board's previous study, based on the situation in 1963-64, drew attention to the fact that although productive capacity had been increasing rapidly, demand had been increasing even more rapidly, with the result that fears of substantial over-capacity had not been realized by 1964. In these circumstances, along with certain special factors, the Canadian industry experienced its greatest volume of exports and there was an export balance of trade of about 28 million pounds, valued at nearly \$3 million in that year. Data submitted by the producers indicated that expansion of capacity throughout the world has out-run increases in demand and there now is a world-wide capacity of approximately 3 billion pounds in excess of total consumption of 10 or 11 billion pounds. Although world demand for polyethylene resin continues to grow rapidly, the expectation of the Canadian industry is that, as the planned new construction throughout the world comes on stream, the over-capacity will continue to exist. This over-capacity has had a depressing effect on prices. The export market for Canadian producers has been reduced to less than one-half the 1964 level and imports, by 1967, had approximately doubled, for a net import balance, in 1967, of about 25 million pounds, valued at approximately \$6 million. The much higher imports in 1968 than 1967 reflected, in part, certain unusual circumstances in the Canadian industry, as noted later in this report.

Much of the increase in capacity has taken place in the U.S.A., western Europe and Japan; the Canadian industry anticipates continued severe competition from producers in the U.S.A. and growing competition from those in Japan.

As world-wide capacity increases, a greater proportion of total output is coming from newer plants of larger scale and later design. The producers in Canada expressed concern that their competitive positions could be expected to deteriorate further in the face of these newer, large-scale plants. For a general purpose grade of polyethylene resin, a plant of 100 million pounds capacity was said to be about the minimum size that would secure most of the economies of scale which were possible; only two of the plants in Canada are of this size.

In contrast to the Canadian situation, in the U.S.A. all but three of the nearly two dozen low density polyethylene plants have an estimated annual capacity of over 100 million pounds each; most of the plants have capacities of about 200 million pounds⁽¹⁾ or, in some instances, well in excess of that amount. Many of these large-scale plants are located in the Gulf Coast area in close proximity to large ethylene plants which, in turn, are so located to take advantage of

(1) Modern Plastics, November, 1967, p. 85

the plentiful, low-cost natural gas available in Texas and Louisiana. The plants geographically closer to the Canadian market tend to be smaller in size. This situation is illustrated by the list of plants in table 2.

Table 2: U.S. Low Density Polyethylene Plants

<u>Location</u>	<u>Estimated 1968 Capacity million lb.</u>	<u>Company</u>
1) Clinton, Iowa	100	Chemplex
2) Tuscola, Ill.	145	U.S.I. (a)
3) Charleston, W. Va.	130	Union Carbide
4) Torrance, Calif.	80	Union Carbide
5) Whiting, Ind.	200	Union Carbide
6) Lake Charles, La.	70	Cities Service
7) Freeport, Tex.	170	Dow Chemical
8) Plaquemine, La.	180	Dow Chemical
9) Longview, Tex.	250	Eastman
10) Baton Rouge, La.	200	Enjay
11) Cedar Bayou, Tex.	200	Gulf Oil
12) Orange, Tex.	200	Gulf Oil
Orange, Tex.	600	Du Pont
13) Texas City, Tex.	180	Monsanto
Texas City, Tex.	230	Union Carbide
14) Houston, Tex.	275	U.S.I. (a)
15) Odessa, Tex.	300	Rexall
16) Port Arthur, Tex.	175	Sinclair-Koppers
17) Seadrift, Tex.	200	Union Carbide
18) Taft, La.	250	Union Carbide
19) Victoria, Tex.	100	Du Pont

Does not include Allied Chemical's 25-million lb. plant

(a) U.S.I. - U.S. Industrial Chemicals Co. (U.S.I. division of National Distillers & Chemical Corporation, N.Y.)

Source: Modern Plastics, November, 1967, p. 85

Many of the companies which produce polyethylene in the U.S.A. operate more than one plant, and the capacity of each company has tended to increase appreciably in recent years, as indicated in table 3.

Table 3: Estimated U.S. Capacity of Low Density Polyethylene

<u>Company</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968-69</u>
		-	million pounds	-
Union Carbide	730	750	800	1,090
Du Pont	300	500	600	700
Gulf Oil	200	220	400	400
U.S.I.	270	340	450	450
Rexall	150	250	300	300
Dow	220	280	280	350
Eastman	150	200	250	250
Monsanto	130	180	180	180
Sinclair-Koppers	75	125	150	175
Allied	25	25	25	25
Chemplex	-	-	-	100
Cities Service	-	-	35	100
Enjay	-	-	-	200
Total	<u>2,250</u>	<u>2,870</u>	<u>3,470</u>	<u>4,320</u>

Source: Modern Plastics, November, 1967, p. 88

Polyethylene resin plants are generally located close to abundant supplies of the basic raw materials; they are, therefore, tied geographically as well as economically to petroleum refineries or to supplies of natural gas. In Canada, Union Carbide produces most of its own monomer, ethylene, from petroleum derivatives; Dow Chemical produces some ethylene and Dow and Du Pont have nearby supplies of ethylene from Imperial Oil Limited at Sarnia. The C.I.L. plant is unique in that it was located in Edmonton to take advantage of abundant ethane in the available natural gas. However, the saving on feedstock cost must be weighed against the higher transportation cost of moving the resin to the main market areas in Central Canada, or to seaboard for export. The three Canadian producers in Ontario and Quebec, the major market area, obtain their raw material supplies from the refineries at Sarnia and Montreal East.

The ethylene monomer is a major element of cost in the production of polyethylene, representing perhaps fifty per cent of direct manufacturing costs and one-third of fully distributed costs for some of the general purpose grades of low density resin. In this regard, the Canadian industry considered that it was at a decided disadvantage compared, for example, with resin producers in the Gulf Coast region of the U.S.A. The cost of ethylene, at least for the three producers in Central Canada, was estimated to be about 1.5 cents per pound higher than it was for producers in the Gulf coast region of the U.S.A. This difference would represent about 10 per cent of the selling price of lower-priced resins which sell for about 15 cents a pound. Considerable planning and investment is taking place by the refineries and chemical companies to ensure the increase in supply of ethylene which may be necessary, in part to meet increased requirements for polyethylene. Uncertainties concerning the cost of ethylene, and of the feedstocks from which it is made in Ontario and Quebec, is another factor of substantial importance to polyethylene producers at the present time. These matters receive more detailed consideration in Tariff Board Reference 141.

When used, most resin contains some additives, chiefly chemicals, to impart particular properties; in some instances, pigments such as carbon black are added to the resin. Usually, the additives represent only a very small part of the weight of the compound and might add only one cent a pound to the cost of material. However, the price of the compound will usually be higher than the price of the resin by more than the additional cost of the material, partly as a result of the additional costs of compounding. All of the polyethylene resin producers also produce compounds by using additives to improve certain properties of the basic resin. In addition to the compounds made by the resin producers, a few companies in Canada, which do not produce resin, such as Kayson Plastics and Chemicals Ltd., of Preston, Ontario, blend and sell polyethylene compounds made from domestic or imported resin.

Apart from the primary sector of the industry, engaged in manufacturing the basic resins and compounds, there are more than 300 companies in Canada which make finished products, or which use the resins in the course of manufacturing other products. These companies turn out a great variety of products and are described by such general terms as moulders, extruders, fabricators; they comprise the secondary plastics industry. No attempt is made in this report to deal with this sector of the industry in detail, though reference to it is made as required throughout the report and, in particular, in the section on Tariff Considerations where representations on behalf of a number of fabricators are presented.

Generally the fabricating plants are engaged in a variety of operations such as summarized below:

	<u>Processes</u>	<u>Sample Products</u>
Polyethylene-- Compounding resin→	→ Extrusion	Pipes, garden hoses Bags Blown film and flat film, sheets, wrappings Wire and cable coating Extrusion coating of paper, paper board, cellophane, metal foil, cloth, glass fibre, etc. Filaments
	→ Injection moulding	Household articles Caps for bottles Industrial items
	→ Blow moulding	Bottles and containers Toys
	→ Calendering	Electrical tape
	→ Thermoforming	Containers Large and flat contour shapes
	→ Spray-coating or dip-coating	Metal protection
	→ Rotational moulding	Hollow objects

In addition to using polyethylene, these firms usually work with other resins such as polyvinyl chloride, A.B.S., polyvinylidene chloride and polypropylene, as well as with other materials. The four producers of polyethylene resin also engage in further processing, particularly in the film and packaging field, on an integrated basis. In some product lines, the output of the resin producers accounts for a substantial part of total supply.

THE MARKET FOR POLYETHYLENE RESINS

The market for polyethylene resin results from its use in a great number of products, produced either by the resin manufacturers or by independent manufacturers. Part of the total market for polyethylene and its products is supplied by imports of resin, by imports of intermediate products, such as film and sheet, and by imports of final products. In addition, production of resin by the manufacturers is influenced by export markets for the resin and these other forms.

In what follows, an outline of the situation for the resin is followed by some comment on the other forms of polyethylene.

The Canadian market for polyethylene resin has continued to be the biggest and consistently the fastest-growing amongst all the plastics materials, expanding at an average of about 20 per cent per year for the last five years. Consumption of the resin reached an estimated 255 million pounds in 1967 and nearly 290 million pounds in 1968; the market value of this consumption is estimated to have been in excess of \$50 million in both years, the higher quantity of consumption in 1968 being partly offset by somewhat lower average prices. It is expected that the market will continue to expand rapidly, aided by many of the newer uses for the resin, for example in shrinkable film, paper-substitutes, laminated sheets for packaging, and in construction and industrial materials, including new applications in the automobile industry. This rate of growth in the market for the resin in Canada at times has caused pressure on available capacity. New uses almost inevitably require the formulation of a resin with somewhat different properties and such new formulations, in turn, open up other uses and lead to additional modifications of one kind or another in the resin. Neither the market nor the resin, therefore, is uniform or standardized, but the changes which are continually taking place are difficult to trace and assess in terms of the relationship of available supply to the particular demands for resin at any given time.

Some indication is given in table 4 of the relative magnitudes of imports and of production in Canada of some of the principal resins, including polyethylene.

Table 4: Canadian Resin Production and Imports, 1963-68

	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
		-	in million pounds		-	
<u>Production of Resins</u>						
Polyethylene	165	196	205	212	231	236
Polyvinyl chloride	47	56	56	66	79	93
Phenolic	49	52	55	62	63	68
Polystyrene	60	61	64	66	54	68
Alkyd	21	21	20	22	25	22
ABS terpolymers	some	4	7	10	18	22
Melamine	4	7	8	10	7	10
Urea	10	10	11	18	17	15

Imports of Resins

Polyethylene	22	27	30	33	49	80
Polypropylene	6	9	13	18	20	32
Polyvinyl chloride	34	43	50	52	48	52
Polystyrene	10	10	10	16	31	30
Alkyd	7	7	10	10	7	12
ABS terpolymers	5	6	6	12	10	10
Phenolic	7	8	8	9	9	9
Melamine	6	5	5	3	3	3
Urea	13	15	10	10	11	15

Source: Canadian Plastics

The overall increase in consumption of polyethylene resin is indicated in table 5 in terms of the available supply derived from shipments, imports and exports. It might be noted that the shipments include substantial quantities of intra-company transfers. Additional details are given in subsequent tables and in Appendix I.

Table 5: The Supply and Disposition of Polyethylene Resin, 1962-68

	<u>Factory Shipments</u> (a)	<u>Imports</u>	<u>Exports</u>	<u>Domestic Supply</u>	<u>Imports as % of Supply</u>
	-	million pounds	-		%
1962	135	27	36	127	21.4
1963	156	22	39	140	16.0
1964	193	27	55	164	16.2
1965	202	30	36	196	15.5
1966	219	33	23	230	14.5
1967	232	49	26	255	19.3
1968	235	77	23	289	26.5

(a) Includes intra-company transfers

Source: D.B.S., Cat. Nos. 46-211, 46-002 and Trade of Canada

Several features of the developments of recent years are evident from table 5. Shipments of resins increased very appreciably in the six years from 1962. The apparent levelling out of shipments in 1968, at a volume well below the capacity reported in the previous section reflects, in part, some problems of production within the industry, including a shortage of ethylene in the Sarnia area, and the fact that the capacity data include increments to capacity which were not in operation for the entire year. Some part of the much higher volume of imports in 1968 can be attributed to these same factors. Spokesmen for the industry regarded the output of polyethylene resin in 1968 as not much below the effective working capacity in that year. Some part of the increase in imports, however, may be attributed to increasing competitive pressures from suppliers outside Canada.

The combination of higher imports and higher shipments from the Canadian industry indicates the extent to which the demand for polyethylene resin is increasing in Canada. Apparently, domestic requirements increased by almost 50 per cent in three years. This occurred at a time when export sales had fallen sharply from the relatively high levels of the early 1960's. The decrease in exports in recent years is evident from table 5, though even in the years 1966-68, exports were the equivalent of about 10 per cent of factory shipments. The reduction in exports contrasts with the situation from 1959 to 1964 when exports were generally increasing more rapidly than imports. The decline in exports might also be attributed in part to the fact that the industry was working at close to effective capacity and most of its production could be disposed of in the growing domestic market.

Even though shipments were not increasing as rapidly as in some of the earlier years, or as rapidly as imports after 1964, there was a substantial increase in the value of shipments (including intra-company transfers) from Canadian plants, from about \$32 million in 1962 to more than \$50 million in 1968. The slower rate of advance in recent years reflected not only the diminished rate of increase in the volume of shipments but also a marked decline in prices; this decline, which continued a trend of longer standing, brought the average price of a typical all-purpose resin down to about 15 cents a pound in 1968 from 19.7 cents a pound in 1964. Increases were announced in some resin prices late in 1968 and early in 1969.

Although the increase in demand for the resin has been great, per capita consumption in Canada remains well below that in the U.S.A., suggesting that there may be scope for further increase in use. Per capita consumption of polyethylene resin in Canada increased from about 6.8 pounds in 1962 to 12.5 pounds in 1967, compared with an increase in the U.S.A., over the same period, from 10.4 pounds to 18.2 pounds. Thus the gap in per capita consumption widened during these years.

The use of polyethylene resin for film and sheet has increased relatively more in recent years than the other uses combined. Film and sheet uses took about 45 per cent of the resin in 1968 compared with 38 per cent in 1962. In addition, over these years, high density polyethylene resin came to be used for a broad range of purposes and now represents perhaps 20 per cent of total polyethylene consumption. An indication of the pattern of consumption is given in table 6.

Table 6: Approximate Pattern of Consumption of Polyethylene Resin

	Million Pounds				Per Cent			
	1962	1966	1967	1968	1962	1966	1967	1968
Film	43.0	86.0	107.3	128.0	38.1	39.8	42.9	45.2
Injection, blow moulding and extrusion	33.0	73.0	76.5	78.8	29.2	33.8	30.6	27.9
Wire and cable coating	16.5	23.5	26.0	27.0	14.6	10.9	10.4	9.5
Pipe	14.0	20.0	19.0	19.4	12.4	9.3	7.6	6.9
Paper coating and other	6.5	13.5	21.2	29.7	5.8	6.3	8.5	10.5
Total Accounted For	113.0	216.0	250.0	282.9	100.0	100.0	100.0	100.0

Source: Canadian Plastics

International Trade

The change in Canada's trade in polyethylene resins, from a position of net export in the early 1960's to a position of net import in 1966-68 has been noted in the preceding section. The comparison is set out in somewhat more detail in table 7.

Table 7: Canada's Trade in Polyethylene Resins, 1962-68

	Imports		Exports		Net Trade	
	Million		Million		Million	
	lb.	\$	lb.	\$	lb.	\$
1962	27.1	7.6	35.5	6.7	+8.4	-0.9
1963	22.4	5.3	39.0	6.3	+16.5	+1.0
1964	26.7	6.2	54.9	9.1	+28.2	+2.9
1965	30.4	6.8	36.1	5.9	+5.8	-0.9
1966	33.4	7.3	22.5	3.6	-10.8	-3.7
1967	49.2	9.9	25.8	3.9	-23.4	-6.1
1968	76.6	12.5	22.5	3.5	-54.1	-9.0

Source: D.B.S., Trade of Canada

Until 1966, over 95 per cent of the imports were from the U.S.A.; even with increased imports from other countries such as Britain, West Germany and Japan, imports of polyethylene resin from the U.S.A. continued to supply more than 85 per cent of total imports in 1967 and nearly 92 per cent in 1968.

Some information is available from U.S. statistics on the proportion of exports to Canada of high density resins and of low and medium densities. Some of the U.S. export data relate directly to resins described in terms of densities, and some of the data are in terms of the resins used for coatings; the latter would generally be of low and medium densities. The data, which differ somewhat in coverage from the Canadian import data, are given in table 8.

Table 8: U.S. Exports to Canada of Polyethylene Resins, 1965-68

Year	Low and Medium Density				High Density	
	Coating		Other			
		U.S.		U.S.		U.S.
	'000 lb.	\$'000	'000 lb.	\$'000	'000 lb.	\$'000
1965	6,873	1,935	12,210	2,841	9,460	1,990
1966	6,231	1,578	18,164	3,578	6,153	1,302
1967	10,844	2,161	27,825	5,504	4,779	1,014
1968	15,559	3,116	49,211	7,832	5,799	1,073

Source: U.S. Department of Commerce, U.S. Exports

The U.S. data indicate that, by and large, the increasing Canadian imports are of resins of low and medium densities; imports of high density resin seem to be declining in importance, presumably as a result of the increasing capability of the Canadian industry to supply requirements of these types of resin. Moreover, particularly for the resins of low and medium densities, the unit values are sufficiently high to indicate that, for the most part, resins of high quality or of more specialized application than the all-purpose grade are being imported. It is also probable that some of the imports consist of compounds; these generally are higher in price than resins without admixture.

The increase in imports and the decline in exports, in recent years, have had some important causes in common: the sharply increasing demand for resins in Canada and the growth in productive capacity in many other countries which not only reduced their dependence upon outside sources of supply but, in some instances, stimulated their competition in other markets. Thus, by 1968 Canada's exports of polyethylene resins had declined by approximately 45 per cent from the average for the years 1962-1965 inclusive. A large part of the decline in exports resulted from much lower shipments to many countries, in particular to the United States, Australia, the Netherlands and Hong Kong. Canada's main export markets continued to be Britain, Hong Kong, the Republic of South Africa and some European countries. The fact that unit values of exports were lower than those of imports suggests that a substantial part of Canada's exports are of basic, all-purpose resins.

PRICES AND PRICING POLICIES

Although prices generally have been increasing, prices of polyethylene resin, like those for some other synthetic resins, have been declining. This downward price trend in all countries reflects three principal influences: lower production costs, in part resulting from improved plant design and performance and from increase in the scale of plants both for the production of resin and for the production of ethylene, -- its principal raw material; concerted efforts on the part of producers to lower the price of the resin as a means of expanding the range of uses for the resin in competition with other materials; and the increase in the number of producers throughout the world with a consequent increase in competition. At the same time that prices were being lowered, spokesmen for the industry claimed that product improvements were continually taking place, with the result that the price reduction was implicitly greater than a simple comparison of prices would indicate.

The decline in the price of polyethylene resins is illustrated by the data in table 9; more detailed information is contained in Appendix I. The data in table 9 are published list prices and are not representative of all of the prices which may be relevant to different users of resin. In the table, it may be noted that the price of the resin in 1968 had fallen to about one-half the level that it had been in 1960, though not all types of polyethylene resins and compounds experienced such substantial declines in price. However, a spokesman at the public hearing observed that the Canadian selling price of standard film grade resin had fallen by about 35 per cent in the last four years and he regarded this decline as typical of resin prices generally. For a utility grade of resin, such as might be used in the manufacture of garbage bags or some types of construction film and film for certain agricultural uses, a price of 12 cents a pound was reported to have existed during part of 1968.

For some types of polyethylene resin there was a firming of prices in the last quarter of 1968 and, following price increases in the U.S.A., Canadian prices of some types of resin increased by almost 2¢ a pound late in 1968.

Some forms or grades of polyethylene resins are higher in price than the lows referred to in the following examples. For example, coloured resins, in the latter part of 1968, were quoted at 25 to 31.5 cents a pound and some resin compounds at 16 to 27.5 cents a pound⁽¹⁾; specialty grade resins may be very much higher in price.

(1) Canadian Chemical Processing, October, 1968

Table 9: Annual Average Price of Polyethylene Resins,
in Canada, 1960-68
(truck lots, delivered)

Natural Resins (Uncoloured)

<u>Year</u>	<u>A v e r a g e</u>	
	<u>Low</u>	<u>High</u>
1960	33.0	36.5
1961	27.0	35.8
1962	27.0	32.8
1963	25.3	29.2
1964	19.7	26.5
1965	20.0	26.0
1966	18.0	25.0
1967	18.0	25.0
1968	14.8	20.6
1968 - Jan.	16.0	19.5
July	15.5	21.0
Oct.	15.5	21.0
Dec.	12.0	21.0

Source: Canadian Chemical Processing, various issues

The average unit value of polyethylene resins used by a large number of Canadian fabricators showed a decline similar to those noted in table 9; for example, the unit value of the resins used by fabricators declined from 33.2 cents a pound in 1960 to 20.2 cents a pound in 1966, the latest year for which the data are available.⁽¹⁾

The trend of prices in Canada is not unlike that in other countries. Polyethylene resins are easily transported and, as capacity to produce them increased in more and more countries, price competition intensified and reductions of prices amounting to 35 per cent or more in the past five years were fairly general, as the examples in table 10 illustrate.

⁽¹⁾ D.B.S., Cat. No. 47-208

Table 10: Polyethylene Resin Prices, Various Countries, 1963-68

	<u>Canada</u>		<u>U.S.A.</u>		<u>U.K.</u>		<u>Belgium</u>		<u>Italy</u>	
			-		Canadian cents per		pound		-	
	<u>Low</u>	<u>High</u>	<u>Injec-</u>	<u>Film</u>	<u>Injec-</u>	<u>Film</u>	<u>Injec-</u>	<u>Film</u>	<u>Injec-</u>	<u>Film</u>
			<u>tion</u>		<u>tion</u>		<u>tion</u>		<u>tion</u>	
1963	25.3	29.2	23.7	25.3	23.9	25.2	19.4	20.1	23.5	25.0
1964	19.7	26.5	23.2	24.8	24.0	25.3	18.7	19.2	25.8	27.4
1965	20.0	26.0	16.6	18.5	20.0	23.7	19.3	20.3	24.6	26.1
1966	18.0	25.0	16.9	19.1	20.0	23.9	19.3	20.3	20.3	24.3
1967	18.0	25.0	18.4	19.2	20.1	24.0	19.4	20.4	19.8	22.0
1968 Jan.	16.0	19.5	18.4	19.3	17.4	20.6	13.9	14.3	12.7	14.1
Oct.	15.5	21.0	14.0	15.0	17.2	20.4	12.2	12.2	10.9	11.7
Dec.	12.0	21.0	14.0	15.0	17.2	20.4	12.2	12.2	11.0	11.7

Note: Price quotations are generally in the first week of January each year and local delivered, single deliveries of 10 to 20 tons; they do not represent lower prices obtainable on larger tonnages; prices are for low density injection moulding grade and industrial film grade

Source: Canadian Chemical Processing; European Chemical News, various issues

Prices in the U.S.A. appear to be slightly more volatile than those in Europe. To some extent this appearance may reflect simply a difference in the method of quoting prices, but it may also reflect somewhat greater swings in the relationship of capacity to demand. Thus, in the U.S.A., a sharp drop in price followed upon a substantial expansion in productive capacity in the early 1960's; some stability and firming of prices then occurred as shortages in supply developed, followed by a sharp decline in the early part of 1968. As has been noted, some increases in prices were announced late in 1968 and in the first month or two of 1969.

The price data in table 10 do not reflect certain underlying changes that are taking place in the sale of polyethylene resins which affect the price that a particular user of the resin must pay. A number of methods have been adopted, particularly by users of large quantities of resins, to reduce further the price per pound for their requirements. Long-term sales contracts may yield somewhat lower prices for the purchaser, and shipments in large quantities, in bulk, can also gain for the user a lower landed cost. For example, shipment by barge or railroad hopper car is now common practice in the U.S.A.; hopper car shipments, which were reported to account for 60 to 70 per cent of all shipments in the U.S.A., may result in discounts of 0.5 to 1.25 cents a pound from the prices quoted for smaller quantities.⁽¹⁾ In addition, there is an increasing demand for resins and compounds formulated specifically for certain uses and a general improvement is taking place in the quality of resins to give greater efficiency in use and better results. The special formulations may increase the unit cost of the resin to the user, but where the product improvement takes place without an increase in price, the user of the resin is gaining in a way not apparent from the price.

(1) Modern Plastics, November, 1967, p. 89

One factor of particular importance in the reduction in prices of polyethylene is the reduction in the price of the monomer, ethylene. In the U.S.A., the price of ethylene was reported to have fallen from 5.25 cents a pound in 1960 to 3.5 cents a pound (or lower) in 1968 and the price of low density, injection moulding polyethylene fell from 26 cents a pound to 11.25 cents a pound in the U.S.A. over that same period.⁽¹⁾ The cost of ethylene is an important element in the cost of producing polyethylene; ethylene was reported by the industry to represent 50 per cent of the direct manufacturing costs of polyethylene and about one-third of total costs including the fully distributed allocation for indirect costs and overhead.

High density polyethylene generally has a higher price than the low density resins. Published prices in Canada for a range of high density resins dropped from 31-34 cents a pound in 1963 to 23-24 cents a pound in 1968.⁽²⁾ Prices for a range of high density polyethylene resins in the U.S.A. fell from $29\frac{1}{2}$ - $31\frac{1}{2}$ U.S. cents a pound to about 18-25 U.S. cents a pound over the same period.⁽³⁾ It was reported that:

"The balance between supply and demand in high density polyethylene has resulted in a much more stable price situation. Since late 1966 the price has been 20¢ for blow moulding material, 18¢ for homopolymer, and 20¢ for copolymer injection molding material, with only occasional outbreaks of price cutting."⁽⁴⁾

There is no indication at the present time that capacity and demand for high density polyethylene resins are moving heavily out of balance and a spokesman for the industry indicated that Canadian capacity to produce high density polyethylene resin was adequate at this time.

Altogether, therefore, the competitive situation of Canadian producers has changed through the years as plants of larger size came on stream and production throughout the world increased. The decline in the price of polyethylene reflected, in part, the lower cost of the principal raw material, ethylene, and the reductions, on a unit-cost basis, of overhead and other indirect costs as the size of the productive units increased. Some of these cost reductions were more in evidence in the U.S.A. and other countries in which the new, large-scale plants were being built and in which corresponding changes were taking place in the production of ethylene. Spokesmen emphasized that it is becoming increasingly difficult for producers in Canada to compete, even in the Canadian markets, because of their cost structure. The difficulty results principally from operating relatively small plants, at times strained to the limits of capacity, as well as the higher cost of ethylene and the production of a number of grades and densities of resin in fairly small quantities in the same production units. These matters are dealt with below under Tariff Considerations.

(1) Modern Plastics, various issues

(2) Canadian Chemical Processing, various issues

(3) The Journal of Commerce, N.Y., various issues

(4) Modern Plastics, May, 1968, p. 51

POLYETHYLENE FILM AND OTHER PRODUCTS

Polyethylene resin is used in several different forms of processing. As the data in the earlier sections indicate, the largest single outlet is through extrusion into film and sheet, the use which has been increasing most rapidly. The second largest use is in articles produced by injection and blow moulding. Uses which do not rank so high in the total consumption of polyethylene resin are, nevertheless, important and some of them offer possibilities for significant gains. These other uses include: wire and cable coating, pipe manufacture and coating and laminating of many kinds. By means of the various processing techniques a vast array of final products are made.

The uses of polyethylene film and sheet continue to increase in variety and the total domestic consumption of the resin in these forms has increased accordingly. These uses include, among many others: industrial shopping bags, other bags and package material, cartons and containers of all kinds, liners and laminated materials, food and garment wraps, and sheeting for building and road construction; recent developments in printing on polyethylene film have increased the product's attractiveness in a great variety of packaging uses. As a result of these many uses, the consumption of polyethylene film and sheet has been growing at about 20 per cent a year, until, in 1967 as table 11 shows, more than 108 million pounds were so used. Much of the production of film is converted into other articles by the company which makes the film; shipments of film and sheet, therefore, are much smaller than production, and the rate of increase of shipments has generally been less than that of production.

Table 11: Production and Shipments of Polyethylene Film,
1963-67

	Production '000 lb.	Shipments		
		'000 lb.	\$'000	¢/lb.
1963	52,503	41,968	19,161	45.7
1964	63,449	45,579	20,725	45.5
1965	81,594	52,850	21,757	41.2
1966	97,030	61,193	25,173	41.1
1967 (prelim.)	108,668	67,465	26,375	39.1

Source: D.B.S., Cat. No. 47-208

Data on exports of film and sheeting are not available but the amounts exported are believed not to be large. Imports have increased over the past few years, as shown in table 12, but not so rapidly as production, nor are they a substantial factor in the total supply of film and sheet in Canada; they are almost all from the U.S.A. A comparison of the unit values of imports and shipments from Canadian companies suggests that imports are higher priced on the average than the film and sheet sold by the companies in Canada. Prices for both imports and domestic shipments have experienced declines in keeping with those for the resins, though spokesmen for the resin producers observed that film prices and some products made from film had not

declined as much as had the prices of resins. An example cited by an industry spokesman was that the prices of bread bags and certain types of industrial bags had declined by less than 10 per cent over the four years in which resin prices had fallen by 35 per cent. He noted also that prices of some moulded products such as toys had risen over that period.

Table 12: Imports of Polyethylene Film and Sheet, 1963-68

	<u>Quantity</u> '000 lb.	<u>Value</u> \$'000	<u>Unit Value</u> ¢/lb.
1963	3,803	2,175	57.2
1964	4,647	2,275	49.0
1965	4,584	2,347	51.2
1966	4,300	2,212	51.4
1967	5,145	2,687	52.2
1968	6,083	2,910	47.8

Source: D.B.S., Trade of Canada

TARIFF CONSIDERATIONS

On January 1, 1969, following the Tariff Board's recommendations under Reference 120, a number of tariff items became effective which were relevant to the scope of this enquiry. In this Reference, 143, the Board was directed to consider whether any changes should be made in the rates of duty under the new tariff item 93902-3 and under tariff items covering other forms of polyethylene; attention was drawn, in the Minister's letter, to the rates of duty to which Canada had agreed in the course of international negotiations. These rates are shown between square brackets in the following enumeration, directly under the existing rate, and are referred to as: GATT Bound Rate. It may be observed that, in the items here enumerated, the M.F.N. rate negotiated under the G.A.T.T. is $2\frac{1}{2}$ percentage points higher than the existing rate.

Existing Tariff Items and GATT Bound Rates

<u>ITEM</u>		<u>B.P.</u>	<u>M.F.N.</u>
93902-Polymerisation and copolymerisation products (for example, polyethylene, polytetrahaloethylenes, polyisobutylene, polystyrene, polyvinyl chloride, polyvinyl acetate, polyvinyl chloroacetate and other polyvinyl derivatives, polyacrylic and polymethacrylic derivatives, coumarone-indene resins):			
(a) Without admixture other than an agent necessary to prevent caking, including scrap and waste; aqueous emulsions, aqueous dispersions or aqueous solutions, without other admixture:			
93902-3	Polyethylene type [GATT Bound Rate]	$7\frac{1}{2}$ p.c.	$7\frac{1}{2}$ p.c. [10 p.c.]
(c) Moulding compositions, n.o.p., including scrap or waste, whether or not completely formulated; such compositions in the form of not fully cured preforms for compression moulding:			
93902-42	Polyethylene type [GATT Bound Rate]	10 p.c.	10 p.c. [12 $\frac{1}{2}$ p.c.]
(g) Plates, sheets, film, sheeting, strip; lay-flat or other tubing, blocks, bars, rods, sticks, non-textile monofilament and other profile shapes imported in lengths, all produced in uniform cross-section:			
93902-82	Polyethylene type [GATT Bound Rate]	15 p.c.	15 p.c. [17 $\frac{1}{2}$ p.c.]

Tariff Proposals

In total, the Board received communications from some fifty companies or associations in respect of Reference 143; these are enumerated in the List of Representations at the beginning of this Report. Most of the communications were letters from manufacturers of polyethylene bags who were opposed to any increase in rates of duty on polyethylene resin; some from companies that extrude film and also make articles from the film.

The four producers of polyethylene resin, C.I.L., Dow Chemical, Du Pont and Union Carbide, presented a joint submission requesting an increase in the rates of duty on the resin and corresponding increases in the other forms of polyethylene for which the existing rates of duty are below those bound by the G.A.T.T. The effect of this proposal would be to increase the respective rates of duty on the various forms of polyethylene to the rates shown in brackets in the preceding enumeration. The increase which assumed greatest importance in the course of the public hearing was that for the resin, for which it was proposed that the M.F.N. rate of duty be increased from $7\frac{1}{2}$ p.c. to 10 p.c.

This proposed increase was supported by Imperial Oil Limited, a producer of ethylene used in the manufacture of polyethylene. The company saw a need to give greater protection to polyethylene as a means of encouraging larger scale, lower cost production of ethylene and the array of chemicals and petroleum products derived from the refinery operations.

The submission by the four producers was supported by the Plastics Pipe & Fittings Division, The Profile Extruders Division and the Custom Moulders Division of the Society of the Plastics Industry of Canada. These divisions of the Society represent a very large portion of the users of polyethylene resins, other than the film extruders. The four resin producers are also members of the Society and participate in the activities of these divisions. There was, however, an important qualification to this support: the submissions by the three divisions of the Society of the Plastics Industry noted that the increase on the resin should be granted only if corresponding increases were made to the other forms of polyethylene. In this regard, however, it must be borne in mind that the existing M.F.N. rate of duty on those articles made from polyethylene which are entered under item 93907-1 is bound at $17\frac{1}{2}$ p.c. under the G.A.T.T. and no increase in that rate was contemplated by the Minister.

The position of the three divisions of the Society of the Plastics Industry was supported in a separate submission by the Daymond Company Limited, a member of the Society.

A number of the companies which expressed opposition to the increase in rates of duty on the resin are members of the Society of the Plastics Industry and were, therefore, taking a position different from that of certain divisions of the Society.

The Canadian Electrical Manufacturers Association (CEMA), on behalf of the member wire and cable manufacturers, opposed any increase in the rates of duty on the resin. Substantial quantities of polyethylene resin are used for the coating of electrical wires and cables, and the Association held that an increase in the rate of duty would tend to increase the cost to the users.

Arguments in Support of the Proposed Increases in Rates of Duty

The four producers of polyethylene resin, in support of the proposal for an increase in the rate of duty on the resin, indicated that circumstances surrounding the production and sale of the resin had changed appreciably since the Board's report on Reference 120 and that these changes justified applying the same rate of duty on polyethylene resin as exists for most of the other principal resins which are made in Canada, namely a rate of 10 p.c., M.F.N.

Among the factors to which the industry drew particular attention in support of its proposal were:

- the rapid increase in imports and decline in exports;
- the ability of the Canadian resin producers to supply all but a very limited number of specialty resins;
- the higher cost in Canada of the main raw material, ethylene;
- the absence of a market in Canada sufficiently large to support plants which could achieve the maximum economies of scale;
- the substantial decline in the price of polyethylene resin in recent years;
- the failure of the existing rate of duty to encourage expansion of production in Canada in keeping with the expansion elsewhere;
- the financial hardship in the industry;
- the changes which had taken place in the licensing arrangements affecting the blown tube method of producing film, and
- the increased share of the market for film which is now held by the non-integrated film producers.

An industry spokesman contended that the attempts by so many producers throughout the world to achieve the lower costs associated with large-scale plants, especially for the production of ethylene, which is costly to transport, had led to over-capacity for polyethylene production in some countries, especially in the U.S.A. Efforts on the part of each producer to use its plant to the fullest possible extent had been a major factor leading to the steady decline in world prices of polyethylene. Canada, it was stated, was particularly vulnerable to low-priced imports because the rate of duty on polyethylene was among the lowest in the world. These imports, moreover, could be very damaging because total Canadian requirements of resin were relatively small. Increased competition of this kind, it was claimed, also could be expected to develop from Japan and producers in the European Economic Community.

The proposed increase in the rate of duty, it was stated, would go some way toward encouraging expansion of capacity and production in Canada and provide attendant benefits from the up-grading of natural resources, provision of employment for highly skilled workers and by encouraging more research and development expenditures in Canada.

In large measure, therefore, the reasons given above by the industry for seeking an increase in the rates of duty on polyethylene resin are based on the commercial situation outlined in the earlier sections of this Report. These commercial and economic reasons are closely linked to one another in the industry's presentation: there are cheaper sources of ethylene elsewhere; economies of plant size are denied to the industry in Canada, unless large export markets can be established; as a result, and as a result, also, of a low rate of duty, the industry in Canada cannot compete effectively either in the markets in Canada or abroad in a way sufficiently profitable to induce investment in large-scale, new plants. Hence, it was claimed, the competitive position of the Canadian producers has deteriorated and must inevitably deteriorate as time goes on. Moreover, the industry claimed, there was no intrinsic reason, under present circumstances, for the rates of duty on polyethylene resin and the other forms of polyethylene to be lower than the rates on the other principal resins which are made in Canada and which, in many instances, compete with polyethylene.

The resin producers also drew attention to the fact that the decline in prices of resin over the past few years had an effect on the absolute amount of protection, and, consequentially, on the probable cost to the user. Hence, based on the now prevailing lower resin prices, the higher ad valorem rate of duty would not represent as much protection, in absolute terms, as producers had enjoyed a few years ago at the lower rate. Moreover, to the user, the additional duty would not offset the price declines of recent years, in terms of the cost of the material to him. For example, if fully incorporated into the price of a resin which sold for 13¢ a pound in 1968, the proposed 10 p.c. rate would raise the price to 14.3¢ a pound, whereas the price, even without any allowance for duty, would have been about 20¢ a pound in 1964. Thus, the users of the resin, it was suggested, would have available much lower priced resin even inclusive of the proposed 10 p.c. duty than was available even a year or two ago. The producers also expressed the view that the prices of film and other products have not reflected fully, if at all, the decline in resin prices; in many instances the price of products made from the resin has increased.

For shapes and forms of polyethylene further processed than resin without admixture, proposals for increases in rates of duty, for the most part, were made consequential upon the increase proposed for the resin; they were simply requests that the existing differentials in rates of duty be maintained, as far as possible at the higher level.

The resin producers took the view that a rate higher than 10 p.c. would be very much more in the interests of the Canadian industry but that the Reference was restricted in scope to an increase of this amount. From the viewpoint of the resin producers, the 10 p.c. rate would be of some assistance and certainly better than the existing $7\frac{1}{2}$ p.c. This higher rate, it was suggested, when considered in terms

of the profitability of the industry, could mean the difference between a profit or a loss for the resin producers without having a substantial effect on the operations of the converters or on the price of the final products made of polyethylene. The resin producers suggested, for example, that any increase in the price of the resin which might result from the higher rate of duty would represent only one cent in the price of a toy made of polyethylene which has a retail price of about \$5.00. Similarly, with respect to the price of electrical wire and cable, any resulting increase in the price of resin would be insignificant in the price of the final wire and cable. The existing rate of $7\frac{1}{2}$ p.c. was said to represent less than one per cent of the price of one sample of electric wire.

The resin producers noted that the price index for electrical wire and cable had increased appreciably over the past few years and that the price of the wire and cable had not been very sensitive to the decline in the price of polyethylene; the wire and cable industry, it was also noted, had the advantage of much higher rates of duty than had the producers of polyethylene resin. The resin producers also pointed out that they had an incentive to increase the price of the resin as little as possible because they were constantly in competition with other synthetic resins and other materials and were constantly seeking to expand the range of uses of polyethylene, partly on a basis of its low cost to the user.

The submission by the four resin producers also drew attention to an important change in respect of patents on the use of polyethylene resin since the matter was before the Board in Reference 120. At that time, Union Carbide's patent control and licensing arrangements for use of the Visking blown-tube method of extruding polyethylene film accorded substantial additional protection to the resin producers in Canada. By those licensing arrangements, 6 cents had to be paid by a licensee on each pound of imported resin used in the process. At the time of Reference 120 this arrangement was the cause of considerable dissatisfaction and apprehension on the part of a number of extruders and was one of the factors affecting the industry in Canada to which the Board drew attention.

In their submission on the present Reference, the resin producers noted that two of the three relevant patents have now expired and that Union Carbide has offered free use of the third patent and is prepared to dedicate it to the public (Volume 1, page 18). This is a change in circumstances of considerable importance in the relationship of the resin producers with the unintegrated film producers.

In the present Reference there was, however, considerable discussion of certain patents for preparing polyethylene film and sheet for printing. The methods of licensing under these patents are the subject of consideration under the Combines Investigation Act and of proceedings in the Exchequer Court of Canada.

Arguments Against the Proposed Increases in Rates of Duty

Opposition to the proposal for increased rates on polyethylene resin came principally from some forty non-integrated film producers and converters and from the Canadian Electrical Manufacturers Association. The Association and the companies generally expressed the view that an increase in the rate of duty would tend to result in increased prices of Canadian polyethylene resin which would, in turn, make worse their competitive position. Fears were expressed by some of the film makers and converters that an increase in the duty on resin also would make their position in the market more difficult in competition with the integrated companies; the latter, it was argued, could increase the price of resin to the non-integrated companies while not increasing the price of film and other products and, thus, reduce the operating margin for the non-integrated companies. In this regard, also, some of the non-integrated companies stated that higher rates on film or other forms of polyethylene would benefit them very little because their principal competition came from the integrated companies and other manufacturers in Canada.

The converters, not unnaturally, took the view that as an element of total cost, even an increase of one cent a pound added many thousands of dollars to their costs of manufacture. For example, the twelve manufacturers of electrical wire and cable that replied to a questionnaire distributed by CEMA reported a use of about 27 million pounds of polyethylene resin, in 1968, valued at nearly \$8 million. On a value basis, CEMA estimated that, in 1966, the wire and cable industry used about 25 per cent of all polyethylene sold in Canada. Because these resins were in the form of compounds, the average price was approximately 30 cents a pound and the increase in duty, if reflected directly in the price of the compounds, might add \$200,000 to the industry's cost, out of a total benefit to the resin producers, from the higher rate of duty, of about \$700,000.

Leco Industries Ltd., one of the main spokesmen for the non-integrated manufacturers which opposed increases in rates, noted that the Canadian polyethylene resin plants have been operating at capacity in recent years; there was, therefore, little evidence that imported resins had been inundating the Canadian market in spite of any world over-supply that might exist and in spite of the existing rate of duty of $7\frac{1}{2}$ per cent on polyethylene resins. Imports, particularly in the past year, have increased but the company suggested that the Canadian resin producers were themselves importers of large quantities of resin and, also, that not all grades of polyethylene are made in Canada. Leco further stated that:

"The difference of $2\frac{1}{2}$ % in the tariff rate on the polyethylene resin will not decide whether or not added resin capacity will be built in Canada. But the addition of this rate from $7\frac{1}{2}$ % to 10% will not only result in a higher Canadian resin price but will also create the opportunity of a future squeeze by the integrated operations." (Vol. 2, p. 283-4)

Other film extruders such as Cryovac Limited (W.R. Grace & Co. of Canada Ltd.) and W. Ralston & Co. (Canada) Ltd. expressed a view similar to that expressed by Leco Industries, that an increase in duty rates on resin would further aggravate the competitive disadvantage of

the non-integrated film manufacturer or converter compared with the fully integrated producer. W. Ralston & Co. argued that the independent film producers must be given the opportunity to purchase resin at world competitive prices if they are to compete against the integrated companies: the only source of resin produced in Canada.

The resin producers disputed the contention that they now held a larger share of the market for polyethylene film than in earlier years and indicated that the independent producers had increased in number through the years and had increased their share of the market. Estimates prepared by C.I.L. were to the effect that resins used by the independent film manufacturers increased progressively to an estimated 47.4 million pounds in 1968 from 17.2 million in 1964; as a result, the share of the market obtained by the independent user of resin has increased from 27 per cent in 1964 to about 40 per cent in 1968. (Vol. 2, p. 222) Other information available to the Board indicates that the number of unintegrated producers of film has increased in recent years and that the production of film by the unintegrated companies has been increasing more rapidly than that of the integrated companies.

Further to the claim that the profits of the independent film manufacturers were being squeezed by a narrowing margin between the cost of resin and the price of the film or other products which they sell, the resin producers, as noted above, observed that, over the past four years, resin prices have been reduced by about one-third but that the prices of film and of other products have declined by a much smaller amount or, in many instances, have increased so that the margin between the cost of resin and the price of products has not narrowed but widened.

Cryovac Limited, a manufacturer of packaging materials, was in general agreement with the views of Leco Industries and W. Ralston & Co., noted above, and added that certain specialty grades of resin must be imported regardless of the rate of duty if the advantages which they offer are to be enjoyed; to increase the rate of duty on these specialty resins would be to increase the cost of such resins without gain to the resin producer in Canada. The company claimed that it was "obliged to import 90% of its resin requirements because Canadian manufacturers do not produce these specialized varieties." (Vol. 3, p. 398)

The spokesman for Cryovac also stated that not all resins produced by a resin manufacturer in Canada would necessarily be available to all users of resin; it was necessary to avoid placing the non-integrated user under additional tariff penalty. In this respect the companies were generally agreed that not all resins could be made available to all users, and that not all users have equipment to process satisfactorily all types of resin.

The resin producers took the view that the range of specialized polyethylene resins which are not made in Canada, or which could not readily be made if the demand justified their production, was now a very small part of total resin requirements. The assessment of this matter is extremely difficult because small variations in two otherwise identical resins can appreciably alter both processing efficiency and product results. It was noted by one spokesman that two shipments of

resin from the same producer might exhibit such variations. Moreover, a resin which has been found to be satisfactory by one user in his equipment might prove to be less satisfactory than some other resin to another user in different equipment or different processing conditions. No well established criteria, therefore, can be used to assess the extent to which the producers in Canada can supply a full range of polyethylene resins and compounds for all uses, though the commercial information seems to suggest that at those times when the capacity of the Canadian plants is not already fully occupied by market demands, the companies can supply a very large part of resin requirements in Canada.

Whether an increase in the rate of duty on polyethylene resin, of the magnitude under consideration, would induce the resin producers in Canada to increase capacity, or vary production, to make available greater quantities of resin and a greater variety of grades, or whether the increase in the rate of duty would simply require the users to pay more per pound for resin are matters difficult to assess. For many uses the quality of the resin, in terms of its performance in a particular process or in the resulting product is a matter of greater importance to the processor than small differences in price from one supplier or another. As a general statement, this consideration of performance, in determining the source from which a converter will take his resin, will tend to be the dominant one for specialty grades of resin.

The integrated companies also noted that they had been the first in the field of film extrusion and in the manufacture of other products and, for many years, had been almost the only source of product improvement; this situation was changing and many of the non-integrated companies now were making independent contributions which, in some cases, also had the effect of increasing the total market for the resin. The resin producers have a considerable incentive to improve the serviceability of the resin and to extend its uses into new major fields. These developments almost invariably help non-integrated companies, at least some of which have been encouraged by the resin producers to establish manufacturing facilities, or to expand existing facilities in particular ways. The relationship between the resin producer and the independent extruder, converter or fabricator was by no means always one of conflict of interest. This fact might be said to have been implicitly recognized by the three divisions of the Society of the Plastics Industry that supported the increase in rates of duty proposed by the resin producers, even though this support was made conditional on increases in rates on other forms of polyethylene and was opposed by a number of non-integrated film extruders and bag manufacturers, some of which are members of the Society.

SUMMARY AND CONCLUSIONS

The scope of this Reference is narrowly confined by its terms, both in the products to be considered and in the rates of duty that may be recommended. The main point at issue is the $7\frac{1}{2}$ p.c. rate of duty on polyethylene resins in tariff item 93902-3, with a rate bound under the General Agreement on Tariffs and Trade at 10 p.c. Any recommended change in the rate of duty on polyethylene resin requires consideration of the rate on moulding compositions under tariff item 93902-42; the rate is 10 p.c. and is bound under GATT at $12\frac{1}{2}$ p.c. It also requires consideration of the rate on plates, sheets and other forms of processed polyethylene covered by tariff item 93902-82 which is 15 p.c. and is bound under GATT at $17\frac{1}{2}$ p.c.

In Reference 120 - Chemicals, the Board reported on polyethylene in the very much broader context of the entire portion of Canada's Customs Tariff relating to chemicals. The most relevant portions of the Board's Report on Reference 120 are set out in two places: firstly, in Part I of Volume 4, "Summary and Conclusions", at pages 289 to 291 and, secondly, in Volume 14, "Artificial Resins and Plastics", at pages 131 to 151. The present Report on Reference 143 - Polyethylene is concerned with the situation existing today, including developments which occurred after the Report on Reference 120.

Polyethylene is a synthetic or artificial resin; it is used in Canada in much greater volume than any other resin and has shown the greatest growth of any resin in the past five years. The number of manufacturers of the resin continues to be four: Canadian Industries Limited, at Edmonton, Alberta, Dow Chemical of Canada Ltd. and Du Pont of Canada Ltd., both at Sarnia, Ontario, and Union Carbide Canada Ltd., at Montreal East, Quebec.

Though the producers have taken steps to increase their production of polyethylene, they have not generally made large capital expenditures in recent years to build new plants or to expand existing production. One company, Union Carbide, has indicated publicly an interest in building further productive facilities; however, the producers, including Union Carbide, urged that there was now but little incentive to expend capital for this purpose. Two further developments were stressed before the Board: the continued decline until the autumn of 1968 in the price of polyethylene resins and the emergence of a significant increase in imports coupled with a decrease in exports.

Canadian productive capacity in 1968 is estimated to have been close to 300 million pounds annually; some further increase in capacity was indicated in the early part of 1969. Of the existing capacity, about 250 million pounds is for low density resins and about 50 million pounds for high density resins. In 1968, domestic production was very close to the available capacity. However, the four producers viewed with apprehension a world-wide over-capacity of three billion pounds beyond a world-wide consumption of 10 or 11 billion pounds.

The producers were concerned that much of the new productive capacity in the U.S.A., Western Europe and Japan consists of plants of larger scale and newer design; a plant of 100 million pounds capacity was said to be the minimum required to benefit by current economies of scale; only two plants in Canada are of this size whereas, in 1968, in the U.S.A., all but three of about two dozen low density polyethylene plants had an estimated annual capacity of 100 million pounds, most of them having capacities closer to 200 million pounds. Many plants in the U.S.A. are located in the Gulf Coast area where large ethylene plants are located to take advantage of the natural gas which is available at low cost. In Canada, Union Carbide produces its monomer, ethylene, from petroleum derivatives and C.I.L., from the abundant ethane in the nearby supplies of Alberta natural gas while both Dow and Du Pont purchase ethylene as their raw material.

The ethylene monomer represents about one-third of the total cost of some general purpose low density resins; for the three producers in Central Canada, ethylene was estimated to cost about 1.5 cents per pound more than for the polyethylene producers in the Gulf Coast region in the U.S.A. or about 10 per cent of the selling prices of these resins. Ethylene is of such a nature that, as yet, its transportation over long distances is uneconomic.

Beyond the four resin producers, there are more than 300 companies in Canada making finished products from the resins or using the resins in the course of the manufacture of other products; many of them, of course, use other plastics as well. The four resin producers also engage in further processing, particularly in the film and packaging field, on an integrated basis.

The market for polyethylene resin has been increasing at an average rate of about 20 per cent per annum for the last five years. Consumption in 1967 reached an estimated 255 million pounds and, in 1968, it probably reached 290 million pounds with a market value of some \$50 million. The market can be expected to continue to expand. In recent years, the greatest increase in use has been for the production of film and sheet: to 45 per cent of total use in 1968 from 38 per cent in 1962.

In the last three years exports were lower in volume than theretofore, although they were equivalent to about 10 per cent of factory shipments; the decline may be partly attributed to the fact that the industry was producing close to its capacity and most of its production could be sold in the growing domestic market.

From 1964 to 1968, imports increased from 27 million pounds to 77 million pounds and exports decreased from some 55 million pounds to about 23 million pounds; the imports are increasingly of low and medium density resins rather than high density resins; of the low and medium density resin imports, the rather high average unit values appear to indicate that they are principally of high quality or specialty grade rather than of the lowest-priced, all-purpose resin. The increase in imports and the decline in exports are due in part to increased domestic consumption and the increased productive capacity in other countries. From 1964 to 1968 factory shipments increased from 193 million pounds to 235 million pounds; during this period imports as a percentage of domestic supply increased from 16.2 per cent to 26.5 per cent.

Throughout the recent years of generally increasing prices, prices of polyethylene resin have been falling; since 1960 Canadian prices of many grades of resin have declined by as much as 50 per cent.

Polyethylene resin is basically an intermediate rather than an end product: it becomes the raw material for the film and sheet extruder, for the moulder (blow or injection) of articles, for the coater of wire or cable, for the pipe manufacturer and for others. There is a marked dearth of data on imports and exports of many of the final products of the resin because of the difficulty of identifying their composition.

In the same way, polyethylene film or sheet is usually an intermediate rather than an end product: it is further manufactured into a great variety of bags, packagings and other things; from 1964 to 1968 the use of resin for film production grew from 62 million pounds to 128 million pounds, or about 20 per cent per annum; because much of the film or sheet is converted into other articles by its producers, the shipment figures are necessarily smaller than production figures and the rate of increase for shipments has generally been less than that for production. Exports of film and sheet are not believed to be large; imports have increased over the past few years but not as rapidly as production; they are not a very substantial factor in domestic supply and appear generally to be more highly priced than the domestic product.

Spokesmen for the Canadian resin producers emphasized the increasing difficulty of competing effectively even within Canada with relatively smaller plants, higher costs for the ethylene monomer and the need to produce a number of different grades of resin in smaller quantities.

The proposal of the resin producers for a higher rate of duty on polyethylene resin was supported by three divisions of the Society of the Plastics Industry: The Plastic Pipe and Fittings Division, the Profile Extruders Division and the Custom Moulders Division; the support was qualified by a request that like increases be made under tariff items pertaining to the relevant compounds, film, sheet and other products. At the time of Reference 120, the Tariff Sub-Committee of the Moulders and Extruders Division of the Society had proposed duty-free entry for resins or rates of duty for the products very substantially higher than any rates which might be recommended for resins.

Opposition to increased rates on the resins came principally from non-integrated film producers and converters and from the Canadian Electrical Manufacturers Association (CEMA); their perturbation was based on the anticipation of higher resin prices detrimental to their competitive position. The non-integrated film producers and converters were particularly apprehensive that the integrated producers could then increase their resin prices without increasing their film prices and thus jeopardize the continued existence of non-integrated film producers; even consequential increases in the duties on film would not dispel this apprehension because their principal competition was from the integrated producer. Some film producers urged that certain grades or qualities of resin were not available from Canadian production; however, there was evidence that Canadian

production now extended over a much wider range than heretofore. CEMA estimated that, in 1966, the wire and cable industry used about 25 per cent, by value, of the polyethylene sold in Canada; in 1968, twelve manufacturers used some 27 million pounds, valued at nearly \$8 million.

The anxiety of the non-integrated film producers should be somewhat tempered by the fact that over the last four years the use of resin by the non-integrated companies to make film and sheet is estimated to have increased by about 175 per cent whereas the same use by the integrated producers increased by less than 80 per cent: from 17 million to about 47 million pounds for the non-integrated producers as compared with an increase from 45 million to about 80 million pounds for the integrated producers. On the issue of the margin between resin prices and film prices, the four integrated film producers were quick to point out that, over the past four years, resin prices were reduced by about one-third while prices of film and other products had not decreased as much, thus increasing the margin for the non-integrated film producers.

In its Report on Reference 120 - Chemicals, Part I of Volume 4 at page 290, the Board mentioned certain licensing arrangements for use of the Visking patent process for making blown tubing; formerly the Canadian resin producers were protected under these arrangements by the requirement that six cents must be paid on each pound of imported resin used in the process. This circumstance, which gave the Board apprehension in its earlier Report, no longer exists.

There was discussion of certain patents for preparing polyethylene film and sheet for printing; the methods of licensing under these patents are the subject of consideration under the Combines Investigation Act and of proceedings in the Exchequer Court of Canada.

The producers of polyethylene resin stressed the impracticality of expanding existing plants to competitive capacities or of building new ones without greater protection than now provided by the Customs Tariff. The Board recognizes the difficulties inherent in their position in competition not only with foreign producers of polyethylene resin and its products but also with producers of other competitive synthetic resins and their products.

In all these circumstances, the Board recommends that the rates of customs duties on the polyethylene type resins of tariff item 93902-3 be increased from $7\frac{1}{2}$ p.c. under the British Preferential Tariff and the Most-Favoured-Nation Tariff to 10 p.c. under both these Tariffs.

As a consequence of this recommendation and in order to preserve the present margin of the users and converters of the resins the Board further recommends that the rates of customs duties in two further tariff items be the subject of consequential increases:

- (1) on the polyethylene type moulding compositions of tariff item 93902-42 from 10 p.c. under the British Preferential Tariff and the Most-Favoured-Nation Tariff to $12\frac{1}{2}$ p.c. under both Tariffs; and

- (2) on the plates, sheets, film and other products of tariff item 93902-82 from 15 p.c. under the British Preferential Tariff and the Most-Favoured-Nation Tariff to 17 $\frac{1}{2}$ p.c. under both Tariffs.

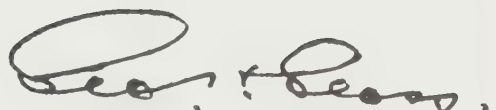
To implement these recommendations, the Board is recommending the deletion of tariff items 93902-3, 93902-42 and 93902-82; the polyethylene products classified in these items would then be classified in tariff items 93902-1, 93902-41 and 93902-81 respectively.

Recommended Schedule

That Schedule "A" to the Customs Tariff be amended by striking out tariff items 93902-3, 93902-42 and 93902-82 and the enumerations of goods and the rates of duty set out opposite each of these items.



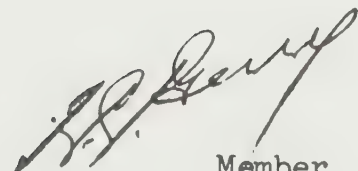
Chairman



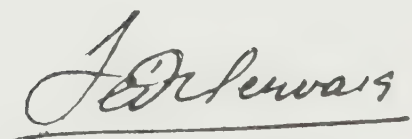
First Vice-Chairman



Member



Member



Member

Ottawa, April 28th, 1969

APPENDIX ISTATISTICS

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Table 1

Domestic Supply of Polyethylene Resins, 1962-1968

<u>Source</u>	<u>Unit</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
Factory Shipments(a)								
	'000 pounds	135,447	156,333	192,520	201,704	219,084	231,769	234,909
	'000 dollars	31,894	33,570	40,053	38,916	43,103	..	..
Imports								
	'000 pounds	27,146	22,437	26,669	30,358	33,372	49,227	76,647
	'000 dollars	7,604	5,332	6,248	6,766	7,341	9,922	12,505
Exports								
	'000 pounds	35,534	38,964	54,857	36,136	22,528	25,827	22,519
	'000 dollars	6,701	6,327	9,109	5,901	3,648	3,863	3,507
Total Domestic Supply								
	'000 pounds	127,059	139,806	164,332	195,926	229,928	255,169	289,037
	'000 dollars	32,797	32,575	37,192	39,781	46,796	..	..
Imports as Percentage of Supply	% by weight	21.4	16.0	16.2	15.5	14.5	19.3	26.5
	% by value	23.2	16.4	16.8	17.0	15.7	..	..

(a) Includes intra-company transfers

Source: D.B.S. Cat. Nos. 46-002, 46-211 and Trade of Canada

Table 2

Imports: Polyethylene resins, s.c. 423-16^(a)

Tariff Items: 90108-1, 90118-1, 90125-1, 90132-1 and 90205-1

<u>Year</u>	<u>Total Imports</u>		<u>Unit Value</u>	<u>Dutiable Value</u>	<u>Duty Collected</u>	<u>Duty as p.c. of Dutiable Value</u>
	cwt.	\$	\$/lb.	\$	\$	
<u>1. Total</u>						
1962	271,457	7,604,113	.280	7,360,622	731,552	9.9
1963	224,374	5,331,909	.238	5,069,870	453,499	8.9
1964	266,688	6,248,227	.234	5,815,202	464,288	8.0
1965	303,576	6,766,033	.223	6,398,054	514,861	8.0
1966	333,723	7,341,341	.220	6,612,676	532,397	8.1
1967	492,274	9,922,025	.202	9,342,591	735,094	7.9
1968	766,474	12,505,000	.163	..	..	..
<u>2. United Kingdom</u>						
1962	2,827	151,166	.535	136,077	13,552	10.0
1963	3,772	118,408	.314	118,408	9,338	7.9
1964	8,596	310,576	.361	310,425	31,034	10.0
1965	3,706	126,567	.342	126,567	12,616	10.0
1966	5,503	198,907	.361	197,498	19,747	10.0
1967	9,851	227,447	.231	227,447	21,891	9.6
1968	3,491	34,000	.097	..	..	..
<u>3. United States</u>						
1962	255,406	7,208,827	.282	6,980,425	696,095	10.0
1963	206,082	4,921,736	.239	4,665,456	419,459	9.0
1964	255,672	5,877,507	.230	5,484,003	431,777	7.9
1965	299,170	6,615,818	.221	6,262,489	501,453	8.0
1966	325,462	7,077,593	.217	6,391,915	510,902	8.0
1967	424,909	8,934,855	.210	8,375,709	657,201	7.8
1968	702,000	11,715,000	.167	..	..	..
<u>4. Germany West</u>						
1962	130	3,756	.289	3,756	370	9.9
1963	812	29,586	.364	23,827	1,907	8.0
1964	2,402	59,797	.249	20,427	1,451	7.1
1965	417	21,416	.514	6,766	625	9.2
1966	1,712	42,019	.245	2,338	179	7.7
1967	2,438	48,254	.198	29,914	2,541	8.5
1968	30,712	30,800	.100	..	..	..

Table 2
(Cont'd)

Year	Total Imports		Unit	Dutiable	Duty	Duty as
	cwt.	\$	Value \$/lb.	Value \$	Collected \$	p.c. of Dutiable Value
5. Italy						
1962	4,924	83,979	.171	83,979	6,645	7.9
1963	10,876	209,644	.193	209,644	18,064	8.6
1964	18	347	.193	347	26	7.5
1965-66	-	-	-	-	-	-
1967	368	8,319	.226	6,371	637	10.0
1968	3,350	41,000	.122	..	..	..
6. Japan						
1962-65	-	-	-	-	-	-
1966	1,046	22,822	.218	20,925	1,569	7.5
1967	53,340	686,421	.129	686,421	51,467	7.5
1968	23,071	363,000	.157	..	..	..
7. Hong Kong						
1962-64	-	-	-	-	-	-
1965	283	2,232	.079	2,232	167	7.5
1968	-	-	-	-	-	-
8. U.S.S.R.						
1962-66	-	-	-	-	-	-
1967	548	4,767	.087	4,767	357	7.5
1968	-	-	-	-	-	-
9. Israel						
1962-66	-	-	-	-	-	-
1967	820	11,962	.146	11,962	1,000	8.4
1968	1,984	24,000	.121	..	..	..
10. Netherlands						
1962	8,170	156,385	.191	156,385	14,890	9.5
1963	2,832	52,535	.186	52,535	4,731	9.0
1968	1,866	20,000	.107	..	..	..

(a) Prior to 1964 included in s.c. 8616 "Polyethylene resins"

Table 3

Exports: Polyethylene/Polythene resins, not shaped, s.c. 424-16

<u>Year</u>	<u>Quantity</u> cwt.	<u>Value</u> \$	<u>Unit</u> <u>Value</u> \$/lb.
<u>1. Total</u>			
1962	355,343	6,701,184	.189
1963	389,643	6,327,317	.162
1964	548,574	9,109,061	.166
1965	361,363	5,900,703	.163
1966	225,275	3,648,000	.162
1967	258,273	3,863,000	.150
1968	225,194	3,507,000	.156
<u>2. United Kingdom</u>			
1962	74,295	1,667,281	.224
1963	63,095	1,262,144	.200
1964	39,328	700,652	.178
1965	17,852	420,569	.236
1966	34,138	620,000	.182
1967	70,256	1,344,000	.191
1968	101,621	1,702,000	.167
<u>3. United States</u>			
1962	52,078	1,071,345	.206
1963	6,685	71,134	.106
1964	5,002	89,688	.179
1965	18,661	214,807	.115
1966	10,411	123,000	.118
1967	5,151	90,000	.175
1968	6,110	110,000	.180
<u>4. Hong Kong</u>			
1962	96,221	1,657,908	.172
1963	149,761	2,332,537	.156
1964	315,883	5,363,039	.170
1965	90,739	1,721,166	.190
1966	36,965	614,000	.166
1967	24,520	324,000	.132
1968	14,623	235,000	.161

Table 3
(Cont'd)

<u>Year</u>	<u>Quantity</u> cwt.	<u>Value</u> \$	<u>Unit</u> <u>Value</u> \$/lb.
<u>5. Netherlands</u>			
1962	26,015	388,380	.149
1963	21,497	288,007	.134
1964	33,325	466,751	.140
1965	38,725	550,379	.142
1966	23,263	267,000	.115
1967	18,816	209,000	.111
1968	11,079	142,000	.128
<u>6. Republic of South Africa</u>			
1962	26,985	525,047	.195
1963	6,729	131,501	.195
1964	20,282	355,150	.175
1965	35,941	653,144	.182
1966	22,845	447,000	.196
1967	66,989	725,000	.108
1968	26,227	307,000	.117
<u>7. Australia</u>			
1962	18,946	423,468	.224
1963	22,266	443,205	.199
1964	25,103	521,590	.208
1965	19,601	426,927	.218
1966	8,865	200,000	.226
1967	34	1,000	.294
1968	51	1,000	.196
<u>8. Other</u>			
1962	60,803	967,755	.159
1963	119,610	1,798,789	.150
1964	109,651	1,612,191	.147
1965	139,844	1,913,711	.137
1966	88,788	1,377,000	.155
1967	72,507	1,170,000	.161
1968	65,483	1,010,000	.154

Source: D.B.S. Cat. No. 65-002

Table 4

Imports: Polyethylene film and sheet, s.c. 424-16^(a)

Tariff Items: 90503-1, 90504-1 and 90605-1

Year	<u>Total Imports</u>		<u>Unit Value</u>	<u>Dutiable Value</u>	<u>Duty Collected</u>	<u>Duty as p.c. of Dutiable Value</u>
	cwt.	\$	\$/lb.	\$	\$	
<u>1. Total</u>						
1962	31,047	2,348,296	.756	2,310,132	425,532	18.4
1963	38,033	2,175,220	.572	2,172,644	319,529	14.7
1964	46,471	2,274,792	.490	2,269,748	304,201	13.4
1965	45,844	2,346,985	.512	2,330,419	310,434	13.3
1966	42,995	2,211,847	.514	2,169,818	293,459	13.5
1967	51,449	2,686,754	.522	2,675,880	360,211	13.5
1968	60,834	2,910,000	.478	..	..	..
<u>2. United Kingdom</u>						
1962	23	1,469	.639	1,469	236	16.1
1963	8	767	.959	295	28	9.5
1964	19	2,798	1.473	1,487	196	13.2
1965	84	6,789	.808	4,153	344	8.3
1966	17	3,512	2.066	2,381	302	12.7
1967	56	6,064	1.083	5,547	633	11.4
1968	10	1,000	1.000	..	..	..
<u>3. United States</u>						
1962	30,979	2,345,175	.757	2,307,011	424,976	18.4
1963	37,938	2,166,215	.571	2,164,111	318,264	14.7
1964	46,325	2,267,527	.489	2,263,794	303,386	13.4
1965	45,743	2,338,002	.511	2,324,072	309,802	13.3
1966	42,905	2,199,651	.513	2,158,753	291,857	13.5
1967	50,834	2,652,736	.522	2,642,379	355,088	13.4
1968	60,036	2,880,000	.480	..	..	..
<u>4. Germany West</u>						
1962	45	1,652	.367	1,652	320	19.4
1963	80	7,305	.913	7,305	1,120	15.3
1964	4	124	.310	124	18	14.5
1965	3	623	2.077	623	93	14.9
1966	6	663	1.105	663	99	14.9
1967	30	2,273	.758	2,273	286	12.6
1968	73	5,000	.685	..	..	..

Table 4
(Cont'd)

Year	Total Imports		Unit Value	Dutiable Value	Duty Collected	Duty as p.c. of Dutiable Value
	cwt.	\$	\$/lb.	\$	\$	
<u>5. Sweden</u>						
1962	-	-	-	-	-	-
1963	7	933	1.333	933	117	12.5
1964	-	-	-	-	-	-
1965	7	1,068	1.526	1,068	133	12.5
1966-68	-	-	-	-	-	-
<u>6. Austria</u>						
1962-63	-	-	-	-	-	-
1964	8	1,882	2.353	1,882	235	12.5
1965	1	157	1.570	157	19	12.1
1966-68	-	-	-	-	-	-
<u>7. Japan</u>						
1962-63	-	-	-	-	-	-
1964	115	2,461	.214	2,461	366	14.9
1965-66	-	-	-	-	-	-
1967	350	4,672	1.335	4,672	582	12.5
1968	152	7,000	.461	..	..	..
<u>8. Italy</u>						
1962-64	-	-	-	-	-	-
1965	6	346	.577	346	43	12.4
1966-68	-	-	-	-	-	-
<u>9. France</u>						
1962-65	-	-	-	-	-	-
1966	36	1,790	.497	1,790	268	15.0
1967	11	865	.786	865	129	14.9
1968	-	-	-	-	-	-
<u>10. Switzerland</u>						
1962-65	-	-	-	-	-	-
1966	31	6,231	2.010	6,231	933	15.0
1967	158	19,246	1.218	19,246	3,379	17.6
1968	49	3,000	.612	..	..	..

Table 4
(Cont'd)

<u>Year</u>	<u>Total Imports</u>		<u>Unit</u>	<u>Dutiable</u>	<u>Duty</u>	<u>Duty as</u>
	<u>cwt.</u>	<u>\$</u>	<u>Value</u>	<u>Value</u>	<u>Collected</u>	<u>p.c. of</u>
			<u>\$/lb.</u>	<u>\$</u>	<u>\$</u>	<u>Dutiable</u>
						<u>Value</u>
<u>11. Hong Kong</u>						
1962-66	-	-	-	-	-	-
1967	10	898	.898	898	112	12.5
1968	514	14,000	.272	..	..	..

(a) Prior to 1964 included in s.c. 8716 "Polyethylene film and sheet"

Table 5

U.S. Exports: s.c. 82580^(a), Polyethylene Resin, Unfin. and Semifin.
Ex. Lam. and Ex. Film and Sheet

<u>Year</u>	<u>Quantity</u> <u>'000 lb.</u>	<u>Value</u> <u>\$'000</u>	<u>Unit Value</u> <u>U.S.\$/lb.</u>	<u>Quantity</u> <u>'000 lb.</u>	<u>Value</u> <u>\$'000</u>	<u>Unit Value</u> <u>U.S.\$/lb.</u>
<u>Total</u>			<u>Canada</u>			
1958	241,843	75,290	.311	21,442	4,839	.226
1959	305,828	95,210	.311	17,131	4,856	.283
1960	330,156	92,669	.281	29,625	7,891	.266
1961	358,127	77,319	.216	20,473	5,922	.289
1962	375,187	70,152	.187	23,046	6,623	.287
1963	336,548	61,049	.181	17,728	4,086	.231
1964	464,272	77,378	.167	23,830	5,245	.220

s.c. 5812002. Resins, Polyethylene, Low & Medium Density,
Thrm. 0.9401, Unfin. Form, Not Protect. Coat. & Adhesiv.

1965	301,455	54,515	.181	12,210	2,841	.233
1966	260,032	47,091	.181	18,164	3,578	.197
1967	265,083	43,794	.165	27,825	5,504	.198
1968	393,008	55,143	.140	49,211	7,832	.159

s.c. 5812006. Resins, Polyethylene, High Density, 0.941 and over,
Unfin. Form, Not Protect. Coat. & Adhesiv.

1965	128,422	26,693	.208	9,460	1,990	.210
1966	94,940	17,800	.187	6,153	1,302	.212
1967	92,303	15,717	.170	4,779	1,014	.212
1968	177,840	26,869	.151	5,799	1,073	.185

s.c. 5812050,^(b) Resins, Polymerization and Copolymerization Synthetic
Except Vinyl Resins for Protective Coating.

1965	32,875	9,906	.301	6,873	1,935	.282
1966	35,097	10,327	.294	6,231	1,578	.253
1967	39,669	11,041	.278	10,844	2,161	.199
1968	53,160	14,865	.280	15,559	3,116	.200

(a) s.c. 82580, 1958 to 1964, s.c. 5812002 and 5812006, 1965 to 1968

(b) Not available prior to 1965

Source: U.S. Exports, U.S. Dept. of Commerce

U.S. Exports to Canadas.c. 82595Polyethylene Film & Sheeting, Except Laminated

<u>Year</u>	<u>Quantity</u> lb.	<u>Value</u> \$	<u>Unit Value</u> U.S.\$/lb.
1958	1,097,247	690,266	.629
1959	951,463	668,957	.703
1960	1,277,539	967,031	.757
1961	1,611,016	1,146,517	.712
1962	1,265,622	995,232	.786
1963	2,099,902	1,737,115	.827
1964	2,762,217	1,901,487	.688
1965(a)	4,574,941	1,973,832	.431
1966	5,440,313	2,413,812	.444
1967	5,009,831	2,382,046	.475
1968	6,254,470	2,941,149	.470

(a) Beginning in 1965 renumbered to s.c. 5812070

Source: U.S. Exports, U.S. Dept. of Commerce

Table 7

Canadian Polyethylene Resin Prices, 1963-68

	Natural Resins		Natural Compounds		Black Compounds		Colors Compounds		High Density		High Density		High Density	
	Low	High	T/L, Dlv.	High	Low	High	T/L, Dlv.	High	ML., 3.5 & 5.5, Wks.	High	ML., 1.0, Wks.	High	ML., 0.20	High
													Low	High
1963														
Jan.	27.0	30.5	27.0	35.0	20.5	39.0	27.0	37.5	-	31.0	-	31.0	-	34.0
July	24.5	28.5	24.5	32.0	20.5	37.0	26.5	37.0	28.0	31.5	28.0	31.5	29.5	38.0
Oct.	24.5	28.5	24.5	30.0	22.5	35.0	-	33.0	-	29.0	-	29.0	-	29.0
1964														
Jan.	24.5	-	24.5	-	-	33.0	-	33.0	-	28.5	-	28.5	-	28.5
July	17.0	26.5	-	21.0	32.5	34.5	-	32.5	-	28.5	-	28.5	-	28.5
Oct.	17.5	26.5	-	22.5	32.5	33.0	-	31.5	-	28.5	-	28.5	-	28.5
1965														
Jan.	21.0	26.5	-	22.5	32.5	33.0	-	31.5	23.0	25.0	23.0	25.0	23.0	25.0
July	21.0	26.5	22.0	28.5	28.0	33.0	-	31.5	23.0	25.0	-	25.0	-	25.0
Oct.	18.0	25.0	20.0	28.5	18.0	33.0	25.0	31.5	23.0	25.0	-	25.0	-	25.0
1966														
Jan.	18.0	25.0	20.0	28.5	18.0	33.0	25.0	31.5	23.0	24.0	-	25.0	-	25.0
July	18.0	25.0	20.0	28.5	18.0	33.0	25.0	31.5	23.0	24.0	-	25.0	-	25.0
Oct.	18.0	25.0	20.0	28.5	18.0	33.0	25.0	31.5	23.0	24.0	-	25.0	-	25.0
1967														
Jan.	18.0	25.0	20.0	28.5	18.0	33.0	25.0	31.5	23.0	24.0	-	25.0	-	25.0
July	18.0	25.0	20.0	28.5	18.0	33.0	25.0	31.5	23.0	24.0	-	25.0	-	25.0
Oct.	18.0	25.0	20.0	28.5	18.0	33.0	25.0	31.5	23.0	24.0	-	25.0	-	25.0
1968														
Jan.	16.0	19.5	18.0	33.0	18.0	33.0	25.0	31.5	23.0	24.0	-	25.0	-	25.0
July	15.5	21.0	16.0	27.5	26.5	28.0	25.0	31.5	23.0	24.0	-	23.5	-	23.5
Aug.	15.5	21.0	-	-	-	-	-	-	-	-	-	-	-	-
Oct.	15.5	21.0	16.0	27.5	26.5	28.0	25.0	31.5	23.0	24.0	-	23.5	-	23.5
Nov.	12.0	21.0	-	-	-	-	-	-	-	-	-	-	-	-
Dec.	12.0	21.0	-	-	-	-	-	-	-	-	-	-	-	-

Source: Canadian Chemical Processing, various issues

Table 8

Polyethylene Resin Prices, 1962-68

	United States			Belgium		
	H.D. Injn. Grade	L.D. Injn. Grade	L.D. Indust. Film Grade	H.D. Injn. Grade	L.D. Injn. Grade	L.D. Indust. Film Grade
	- Canadian cents per pound -					
<u>1962</u>						
Oct. 5	-	-	-	26.5	19.4	20.1
<u>1963</u>						
Jan. 4	34.5	23.7	25.3	26.5	19.4	20.1
Oct. 4	27.0	23.2	24.8	26.5	18.7	20.4
<u>1964</u>						
Jan. 3	27.0	23.2	24.8	26.6	18.7	19.2
Oct. 2	26.9	16.7	18.6	26.5	19.4	20.3
<u>1965</u>						
Jan. 1	26.9	16.6	18.5	26.4	19.3	20.3
Oct. 1	21.5	16.9	19.1	24.9	19.4	20.3
<u>1966</u>						
Jan. 7	21.5	16.9	19.1	24.9	19.3	20.3
Oct. 7	21.6	17.0	19.2	25.0	19.4	20.4
<u>1967</u>						
Jan. 6	19.4	18.4	19.2	25.0	19.4	20.4
Oct. 6	19.3	18.3	19.1	23.5	16.6	17.1
<u>1968</u>						
Jan. 5	19.5	18.4	19.3	23.2	13.9	14.3
July 5	19.3	14.0	15.0	23.0	12.8	12.8
Aug. 2	19.3	13.9	15.0	23.0	12.8	12.8
Sept. 6	19.3	14.0	15.0	22.2	12.8	12.8
Oct. 11	19.3	14.0	15.0	22.4	12.2	12.2
Nov. 1	19.3	14.0	15.0	22.4	12.2	12.2
Nov. 29	19.3	14.0	15.0	22.4	12.2	12.2
Dec. 20	19.3	14.0	15.0	22.4	12.2	12.2

Polyethylene Resin Prices (Cont'd) Table 8

	Italy			United Kingdom		
	H.D. Injn. Grade	L.D. Injn. Grade	L.D. Indust. Film Grade	H.D. Injn. Grade	L.D. Injn. Grade	L.D. Indust. Film Grade
	- Canadian cents per pound -					
<u>1962</u>						
Oct. 5	35.2	23.4	25.0	32.7	24.0	25.2
<u>1963</u>						
Jan. 4	31.3	23.5	25.0	32.8	23.9	25.2
Oct. 4	29.3	24.7	25.1	32.8	23.9	25.2
<u>1964</u>						
Jan. 3	29.4	25.8	27.4	32.7	24.0	25.3
Oct. 2	29.3	24.6	26.1	28.8	23.9	25.2
<u>1965</u>						
Jan. 1	29.2	24.6	26.1	28.8	20.0	23.7
Oct. 1	28.2	20.3	24.3	26.2	20.0	23.8
<u>1966</u>						
Jan. 7	28.2	20.3	24.3	26.2	20.0	23.9
Oct. 7	27.6	19.8	22.0	26.3	20.1	24.0
<u>1967</u>						
Jan. 6	27.6	19.8	22.0	26.3	20.1	24.0
Oct. 6	27.5	13.3	13.3	26.9	20.0	23.8
<u>1968</u>						
Jan. 5	27.8	12.7	14.1	23.3	17.4	20.6
July 5	25.9	11.7	13.7	23.1	17.2	20.4
Aug. 2	25.9	11.7	13.7	23.1	17.2	20.4
Sept. 6	25.9	11.7	13.7	23.1	17.2	20.4
Oct. 11	25.9	10.9	11.7	23.1	17.2	20.4
Nov. 1	25.9	10.9	11.7	23.1	17.2	20.4
Nov. 29	25.9	10.9	11.7	23.1	17.2	20.4
Dec. 20	25.9	11.0	11.7	23.1	17.2	20.4

Note: The prices, local delivered, are based on single deliveries of 10-20 tons and do not represent the lower prices obtainable for larger tonnages

Source: European Chemical News

Table 9

Production^(a) and Shipments of Polyethylene Film and Sheet, 1962-1967

		<u>3 Mils and Under</u>	<u>Over 3 Mils to 10 Mils</u>	<u>Over 10 Mils</u>	<u>Total</u>
<u>1962</u>					
Production	'000 lb.	34,293	9,508	421	44,221
Shipments	'000 lb.	28,696	5,984	419	35,099
	\$'000	13,434	2,702	194	16,330
<u>1963</u>					
Production	'000 lb.	(b)	52,216	287	52,503
Shipments	'000 lb.	30,603	11,079	287	41,968
	\$'000	13,982	5,024	155	19,161
<u>1964</u>					
Production	'000 lb.	47,597	15,852	(b)	63,449
Shipments	'000 lb.	33,570	12,009	(b)	45,579
	\$'000	15,221	5,504	(b)	20,725
<u>1965</u>					
Production	'000 lb.	56,128	24,311	1,155	81,594
Shipments	'000 lb.	37,028	14,741	1,081	52,850
	\$'000	15,449	5,738	570	21,757
<u>1966</u>					
Production	'000 lb.	67,681	27,856	1,493	97,030
Shipments	'000 lb.	43,113	16,672	1,408	61,193
	\$'000	18,069	6,380	724	25,173
<u>1967</u>					
Production	'000 lb.	77,673	29,622	1,373	108,668
Shipments	'000 lb.	49,562	16,603	1,300	67,465
	\$'000	19,876	5,955	544	26,375

(a) Includes the production of film converted within the same plant

(b) Included in "Over 3 Mils to 10 Mils"

Source: D.B.S. "Plastic Film Review 1962-1967"

Table 10

Estimated Polyethylene Resin Commercial Consumption, 1963-68

	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>
		-	million	pounds	-			-	per	cent	-	
Film	55.0	62.3	75.5	86.0	107.3	128.0	40.1	38.9	40.2	39.8	42.9	45.3
Injection, blow moulding and extrusion	43.0	53.5	64.5	73.0	76.5	78.5	31.4	33.4	34.4	33.8	30.6	27.8
Wire and cable coating	18.6	18.6	22.2	23.5	26.0	27.0	13.5	11.6	11.8	10.9	10.4	9.5
Pipe	13.0	17.0	16.0	20.0	19.0	19.4	9.5	10.6	8.5	9.2	7.6	6.9
Paper coating and Other	7.5	8.7	9.6	13.5	21.2	29.7	5.5	5.5	5.1	6.3	8.5	10.5
Total Accounted For	137.1	160.1	187.8	216.0	250.0	282.6	100.0	100.0	100.0	100.0	100.0	100.0

Source: Canadian Plastics

Table 11

Imports of Polyethylene by Tariff Item, 1966-68

	Resins	Compounded Resins & Waste	Film & Sheets, Etc.			Total Film & Sheet	Total Imports
	90108-1	90205-1	90503-1	90504-1	90605-1(a)		
			- thousand dollars -				
<u>1966</u>							
Total	5,472	1,252	1,634	813	2,223	4,670	11,394
U.K.	-	198	3	-	41	44	242
U.S.	5,449	1,054	1,631	801	2,053	4,485	10,988
Japan	21	-	-	6	41	47	68
Germany W.	2	-	-	-	39	39	41
Israel	-	-	-	-	5	5	5
Italy	-	-	-	-	1	1	1
Other	-	-	-	6	43	49	49
<u>1967</u>							
Total	8,175	1,564	1,897	1,008	2,661	5,566	15,305
U.K.	34	194	51	25	60	136	364
U.S.	7,420	1,353	1,836	961	2,413	5,210	13,983
Japan	686	-	5	10	35	50	736
Germany W.	19	11	3	-	41	44	74
Israel	11	-	-	-	-	-	11
Italy	-	6	-	-	22	22	28
Other	5	-	2	12	90	104	109
<u>1968</u>							
Total	9,684	2,693	2,013	1,304	2,761	6,078	18,455
U.K.	21	10	33	52	72	157	188
U.S.	8,949	2,664	1,954	1,239	2,439	5,632	17,245
Japan	362	-	6	6	69	81	443
Germany W.	267	19	3	3	50	56	342
Israel	24	-	3	-	-	3	27
Italy	41	-	-	-	57	57	98
Other	20	-	14	4	74	92	112

(a) A portion of this item would be polyethylene

Source: D.B.S., Imports by Tariff Item



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